Children's Understanding of "Knowing How" and "Knowing That" with regard to Self and Other

FUNG Yau-Fong

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Abstract

The present study includes a set of experiments on children's understanding of "knowing how" and "knowing that" for self and other. It was conducted with seventy-two 3-, 4-, and 5-year-old preschool children in Hong Kong, China. Children were asked to judge their own states of knowing as well as that of others at critical phases of the tasks: (1) Pre-exposure; (2) Post-exposure; and (3) Post-performance. Our results reveal a clear developmental progression in children's understanding of "knowing how" and "knowing that," regardless of self or other. In general, children demonstrated better self-understandings than other-understanding, regardless of "knowing how" or "knowing that." Moreover, children's understanding of "knowing that" preceded their understanding of "knowing how" despite variations among experiments. Furthermore, children's interpretation of "knowing how" and "knowing that" proceeds from an early sense of distinctive use of performance outcome to later appreciation of the significance of informational access in the formation of knowledge.

摘要

本研究的一系列實驗旨在測試小朋友對於 "識" (knowing how) 和 "知" (knowing that) 這兩個概念的理解，當中包括小朋友對自己及對其他人的了解。本研究在中國香港進行，七十二位受試者分別爲三、四、五歲就讀幼稚園的小朋友。在實驗當中，小朋友需要在若干個重要時刻判斷自己和其他人的認識狀態 (states of knowing)： (一) 在獲得有關資料前 (pre-exposure)；(二) 在獲得有關資料後 (post-exposure) ；與及 (三) 在其他人表現後 (post-performance)。研究結果發現，隨著年齡增長，小朋友在 "識" 和 "知"這兩個概念上，無論是對自己還是對其他人的了解，都有顯著的發展。一般而言，不論是 "識" 或是 "知" ，小朋友對於自己的認識狀態了解比對其他人的認識狀態了解爲佳。其次，就算實驗設計上有所不同，結果是同樣發現小朋友對於 "知" 概念的理解比對於 "識" 概念的理解爲佳。再者，小朋友對於 "識" 和 "知" 這兩個概念 的理解似乎從人們的表現開始，發展至其後懂得欣賞獲得資料在知識建立過程中的重要性。

CHAPTER ONE

Introduction

Various studies have examined what children understand about mental states (e.g., knowing and thinking) and their appreciation of similarities or differences in mental states across different targets (e.g., Astington, Harris, & Olson, 1988; Flavell, Miller, & Miller, 1993; Gopnik & Astington, 1988; Johnson & Wellman, 1982; Ruffman & Olson, 1989; Taylor, Cartwright, & Bowden, 1991). Yet most of these studies have focused on children's understanding of their knowledge of facts -- "knowing that" but not their knowledge of skilled action --"knowing how." "Knowing that" and "knowing how" are different (e.g., one can know that a cake is baked, without knowing how to bake it, and vice versa). Imagine spending a leisurely Saturday afternoon at home, sharing a piece of tiramisu with your 4-year-old daughter, who is interested in cookery. While she is eating, she looks up at you and asks, "What is this called?" Of course, you would able to tell her that it is tiramisu; however, you may not be able to answer her next question- "How was it made?" Indeed, this situation involves several aspects of the child's understanding of "knowing how" and "knowing that." First of all, in this example the child shows an understanding of knowledge of self. This refers to the girl's ability to recognize that she herself does not know the name of the food and does not know how it was made. Second, the child exhibits an understanding of knowledge of the other. This refers to the girl's ability to recognize that her mother/father may know the name of the food or how to make it. Actually, the girl's ability to recognize her own ignorance as well as an other's states of knowing depends on the sophistication of her "theory of mind"- her understanding of her own mental states and that of others. Thus, in order to have a comprehensive study of

children's understanding of knowing, both the concepts of "knowing that" and "knowing how" with regard to self and other should be included.

The purpose of this study was to investigate the development of children's understanding of "knowing how" and "knowing that" for both self and other in three experimental paradigms. The results of Fung (2000) suggest this ability develops during the preschool years. In the study of Fung (2000), children were asked to report their states of knowing before and after they had learned the contents of a drawer (i.e., by looking inside or being told about the contents by the experimenter) or the skills to perform a magic trick. It was found that 3-year-old children consistently reported that they "know" before they had access to the relevant information whereas the 5-year-old children were able to report that they "didn't know" in such a state of ignorance. Moreover, Wimmer, Hogrefe, and Perner (1988) found that most 4-year-olds but few 3-year-olds understood the relation between exposure to perceptual information and resulting knowledge. Thus, the present study recruited preschool children ranging in age from 3 years to 5 years in order to determine the developmental progression in children's understanding of knowledge, if any. Gender differences in children's understandings of "knowing how" and "knowing that" were also explored in this study.

In fact, the domain of "knowing" is key in the mental state literature. It consists of two major concepts which young children are most likely to come across: "knowing how" and "knowing that." "Knowing how" and "knowing that" are widely described as procedural knowledge and declarative knowledge, respectively, in the field of cognitive psychology (Browne, 1997). "Knowing how" is typically revealed implicitly through performances on tasks for which conscious awareness of an experienced event is not

necessary (Lorsbach, Sodoro, & Brown, 1992). For example, if one asks a child to reveal his/her ability to play a piano, he/she would simply show it by playing pieces of music in front of others instead of describing his/her knowledge in spoken words; in fact, demonstrating such competence is far easier than describing it. Therefore, "knowing how" has been referred to as knowledge which is procedural (Tulving, 1985), "implicit" (Graf & Schacter, 1985), and "indirect" (Johnson & Hasher, 1987).

"Knowing that," on the other hand, is expressed explicitly when asked to bring to mind a prior experience with conscious awareness (Lorsbach, Sodoro, & Brown, 1992). For instance, when a child claims, "I know that doll is under the bed," she is referring to her "knowing that" and making use of her recall of a particular event. Thus, "knowing that" has been described as the knowledge which is "episodic" (Tulving, 1972), "explicit" (Graf & Schacter, 1985), and "direct" (Johnson & Hasher, 1987).

The concept of "knowing how" might be an important mental state instrumental in the emerging awareness of young children who are busy acquiring skills such as learning how to run, jump, feed themselves, put on clothes, write, or draw (Tardif & Wellman, 2000). Because learning how to do something is closely related to the mental state of "knowing how," it is necessary for children to develop a concept about "knowing how." Similarly, the concept of "knowing that" is also important for young children's understanding of mind. Children, during the preschool years, start to differentiate "what is known" and "what is not known" in order to communicate effectively with others. For example, when chatting with another person, we need to make assumptions about his/her state of knowledge, and the way we express ourselves is guided by these assumptions (Nickerson, Baddeley & Freeman, 1987).

Without doubt, children have everyday experiences of other people in their immediate environment (e.g., parents, older siblings) who are more knowledgeable and competent than they are. In other words, children are often in the position of not knowing. Being aware of when we do not know is important; otherwise, we do not know when to seek help. On the other hand, being aware that we know various facts and have different kinds of skills give us confidence about our competence and this influence our actions. Similarly, being aware of what others' know allows us to monitor our conversations and to decide when it is necessary to adjust our elaboration of details. All of the above stated that knowledge about the mind plays a critical role in children's everyday communication with other people (Dunn, 1994) and their social understanding (Leekam, 1993; Taylor, 1996). Given this account of the importance of knowing to children's cognitive and social development, the present study investigated Hong Kong Chinese children's understandings of "knowing how" and "knowing that" in both themselves and others.

Bartsch and Estes (1996) suggested that children's initial understanding of mental states provides a foundation for later metacognition- cognition about cognition. As Wellman (1985) proposed, metacognition consists of a large, multi-faceted theory of mind. That is, theory of mind constitutes the framework within which more specific metacognitive understandings (e.g., a recognition that looking leads to knowing) can develop. Thus, I consider the relation between theory of mind and metacognition below.

"Knowing that One Knows"

Children's understanding of mental states is one aspect of what has been broadly termed "metacognition" (e.g., Astington, 1993; Bartsch & Wellman, 1995; Flavell, Miller, & Miller, 1993; Perner, 1991: Wellman, 1990). Metacognition is regarded as individuals'

awareness and regulation of their own cognitive states and processes (Flavell, 1985). It is presumed to consist of two major components: metacognitive awareness and metacognitive experience. Metacognitive awareness refers to people's knowledge about the cognitive states and processes of both themselves and others (Corkill, 1996), whereas metacognitive experience refers to the cognitive or affective experiences that go along with some ongoing cognitive endeavors (Flavell, 1979).

Metacognitive awareness, the focus of the present study, can be further subdivided into individuals' knowledge about differences among people, tasks, and strategies. When thinking about persons, we can further subdivide our understanding into three factors: (1) intraindividual differences; (2) interindividual differences; and (3) universals of cognition (Flavell, 1979). Having knowledge about intraindividual differences means that individuals could be aware of how their cognitive processes differ across situations (e.g., they know that they learn better by reading than listening; Corkill, 1996). This is similar to the awareness of how "knowing how" and "knowing that" vary across different critical points of tasks. For example, before we have exposure to the relevant information, we should claim that we "don't know" and only after we have access to the information, can we claim we "know." Having knowledge about interindividual differences implies an understanding that people may differ in their cognitive processing competences and strategies as they involve comparisons between individuals, says, the self versus other people or person A versus person B (e.g., persons know that one friend is better at sports than another; Corkill, 1996). Both intraindividual and interindividual differences were investigated in the present study.

Apart from the intraindividual and interindividual differences among people's mind,

children's "theories of knowing" are also explored. In fact, children's conception of "knowing how" and "knowing that," is a reflection of how they reason about knowledge. Children may interpret the states of knowing with reference to external states (e.g., performance outcome) or they can understand it in terms of the presence or absence of a knowledge base. No matter how chidlren comprehend "knowing how" and "knowing that," epistemology provides us with some ideas of what knowledge is.

"Knowing" versus "Guessing"

From the view of epistemologists, knowledge is true belief that can be backed up with an account or explanation (Greco, 1999). In other words, when we claim to know something, we should be able to give good reasons for it. For example, when we claim to know there is a doll inside a box, we are able to justify our knowledge by saying that we have looked at it before. Moreover, epistemologists regard persons who know as different and superior to those who have only an opinion, even if the opinion happens to be true. In this view, persons who only have an opinion should be better regarded as "guessing" instead of "knowing," since they are not able to justify their belief by giving reasons on demand (Greco, 1999). Similarly, psychologists also address the differences between "knowing" and "guessing". In the study of Johnson and Wellman (1980), young children were found to confuse the cases of knowing and guessing. They could not differentiate the mental verbs of "know" from "guess" by referring to the presence or absence of a knowledge base. Moreover, children were found to rely on performance outcome as the basis of mental verbs judgments. These findings raise the question of whether young children understand the states of knowing in terms of the performance outcome or the presence of a knowledge base or both of them. In the present study, children's

understanding of knowing was studied under four manipulated conditions as stated in Table 1, which were formed using different combinations of access to information and success of performance (or correctness of response).

Table 1
Four Manipulated Conditions for the "Knowing How" and "Knowing That"

Conditions	Access to information	Successful Performance
Knowing	+	+
Guessing	-	+
Not Yet Mastered	+	-
Unknown	-	-

"+" represents the presence of informational access or successful performance;
"- " represents the absence of informational access or successful performance.

As can be seen in Table 1, only one of these four conditions can be truly regarded as "knowing." This is the condition in which persons are able to demonstrate successful performances (e.g., able to tell the contents of a box correctly) and justication of their knowledge with a knowledge base (e.g., having access to the contents before). However, if the persons only demonstrate successful performances but are not able to justify them with reasons, this is better regarded as "guessing." For those who have a knowledge base (i.e., access to relevant information) but are not able to demonstrate successful performance, their state should be regarded as "not yet mastered." This situation is similar to the case in which although a teacher has already taught students how to do a particular type of mathematics in class, some of her students still do not know how to solve given mathematics questions of this type after class. In this example, the students have access to learning, but they can not yet demonstrate successful performance. The last condition is thecharacterized as "unknown," which is simply the case of no access, and, therefore, they

"don't know" how to perform successfully.

If children confuse "know" with "guess," they are likely to overestimate their own and others' knowledge. In contrast, if children understand that informational access is essential for "knowing how" and "knowing that," they will not attribute knowledge to themselves or others when they do not have informational access. In short, overestimation of knowledge results from children's inability to conceptualize the processes by which "knowing how" and "knowing that" are constructed from informational access.

Theory of Mind: Self versus Other

By far, most studies of children's understandings of different persons' mental states under the theory of mind paradigm have contrasted the self to the other (Miller, 2000). Within the theory of mind framework, the relation between developing understandings of one's own and developing understandings of the other's mental states has been regarded as the main focus for discussion. The typical question asked is "Do children experience their own mental states directly and then use such knowledge of self to simulate the experience of others?" or "Does the understanding of one's own mental states have to be inferred in much the same way as the understandings of other's mental states?" (Taylor, 1996). Different theories about the development of theory of mind vary in their predictions.

Proponents of the "theory theory" position claim that children's understanding of mind is sets up as a causal-explanatory system which is analogous to characteristics of theories (Gopnik & Wellman, 1994). Changes in children's understanding of mind may be observed as the theory changes. In this view, the process underlying the discovery of one's own psychological states is similar to the process underlying the discovery of the psychological states of other people (Taylor, 1996). Thus the theory theorists predict

young children's development in understanding of their mental states to proceed in parallel with their understanding of other's mental states (Taylor, Esbensen, & Bennett, 1994). Children who have difficulty understanding other people's mental states should have difficulty in identical ways and to the same extent in their understanding of their own mental states (Taylor, 1996). Children's knowledge about mind for both themselves and others' are understood roughly simultaneously, with no general priority of one or another (Miller, 2000). As for the accuracy of children's reports of their own mental states, theory theory does not expect them to be particularly accurate since children's own mental states have to be inferred instead of being directly perceived. Thus, the possibility of error is much more likely and the types of errors they make depend on the general theory of mind children hold (Taylor, 1996). Therefore, in this view, young children's reports of others' mental states are also not expected to be especially accurate because of their mis-reporting of their own mental states.

In contrast, simulation theory (Harris, 1992) states that a theory of mind is not necessary for having psychological beliefs. Psychological beliefs are simply the result of having a mind which gives rise to psychological experiences (Goldman, 1993). In this view, young children experience their own mental states directly and use their understanding of minds as the basis for making inferences about the mental states of others (Johnson, 1988). Thus, proponents of simulation theory predict young children's understanding of their own mental states will emerge earlier than that of other people (Taylor, Esbensen, & Benett, 1994). Self-knowledge about mental states has the characteristics of immediacy, which is not possessed by knowledge about others. Therefore, given prior self-understanding of mental states, others' mental states are understood via a simulation process (Miller, 2000).

In actuality, both sequences of understanding about mental states – self and other equivalent and, self earlier than other – are found in the empirical literature. The false belief task (unexpected contents task) is commonly viewed as a typical task that involves self-other comparisons about knowledge of mental states, and studies involving such tasks also report mixed findings. However, none of these studies indicate a large discrepancy between self and other (Miller, 2000). Most of the evidence about self-other comparisons has come from research on false belief and was designed to examine children's knowledge of "thinking." What has not been examined is children's understanding of "knowing" with regard to both themselves and others. Thus, self-other comparisons about young children's understandings of "knowing how" and "knowing that" will be a central issue investigated in the present study. This is important, because indications from previous research (Fung, 2000; Moore, Furrow, Chasson, & Patriquin, 1994; Tardif & Wellman, 2000) suggest that children's understanding of some forms of "knowing" may precede their understanding of "thinking." Thus, it may be more possible to catch early differences in children's emerging understandings of mental states by examining their understanding of knowing. If children's understanding of their own "knowing" and that of others require a similar level of cognitive abilities, then it is likely that both kinds of knowledge will emerge simultaneously. If, on the other hand, children acquire understanding of knowing for one's self versus for others at different rates, this would suggest that one of them is more difficult than another. As mentioned before, since young children experience their own mental states directly, but not that of others', it seems to be logical to assume that self-understanding is better than other-understanding. Thus, it is hypothesized that children's understanding of knowing for self emerges earlier than for other.

Children's "Theory of Knowing How"

Perner claimed that successful action and access to information are basic elements of knowledge (Esbensen, Taylor, & Stoess, 1997). Will children incorporate these elements into their theory of "knowing how?"

(i) Successful Action

Based on some empirical evidence that many 3-year-old children and some 4-year-olds use the word "know" to refer to a person who acts successfully, even though the person did not have prior access to the relevant information (Johnson & Wellman, 1980; Perner, 1991; Wellman & Johnson, 1979), Perner argued that successful action is the most salient indicator of knowing among children. Bearing in mind that successful action is neither a necessary nor a sufficient indicator of knowledge, it is interesting to examine whether successful action is a salient indicator of "knowing how" for children.

(ii) Access to Information

Apart from successful action, access to information is also necessary for "knowing how." In order to have a fully developed theory of "knowing how," children should also recognize that having access to the information is a prerequisite to "knowing how." This is because, without access to a learning opportunity, children would not be able to perform a particular task successfully, and would not be able to claim that they "know how."

As stated above, it is proposed that children's "theory of knowing how" has two major components. Moreover, it is hypothesized that children acquire the two components in the sequence of successful action followed by access to information. Such a sequence of development is suggested by the fact that successful action is the most salient indicator of "knowing how" and once the children know how to do particular things, they simply

forget about the source of their knowledge (Fung, 2000) and, thus, do not pay much attention to how they accessed the information.

Children's "Theory of Knowing That"

Similarly, in order to understand the concept of "knowing that," children should recognize certain basic elements: truthfulness and access to information. Again, it is interesting to investigate when children begin to incorporate these elements into their theory of "knowing that."

(i) Truthfulness

It is agreed that a person who says, "1+1 equals 3" cannot be said to "know" the answer to this question as the belief is false. In general, the awareness of some state that is consistent with the true state of affairs is "knowing" (Montgomery, 1992). Young children show early accomplishment in differentiating states consistent with the true state of affairs from those inconsistent with the true state of affairs: children as young as age of 2 to 3 refute false statements and support true ones in their conversations (Pea, 1982).

To grasp the meaning of knowing, children are required to be credited with a conception of truthfulness since a person's knowledge references a true state of affairs (e.g., a person can "know" there are candies in a box only if the box really contains candies; Esbensen, Taylor, & Stoess, 1997). In fact, "knowing that" is the knowledge which is related to learning factual information about the world in which we are living. Therefore, examining whether young children take the true state of affairs into account for their knowing would be a useful starting point for understanding children's "theory of knowing that."

(ii) Access to Information

Other than truthfulness, children should understand that having access to information is critical for "knowing that." Without access to information, children will not be able to tell what has happened in the world, and this will not allow a child to qualify as "knowing that."

Similar to children's "theory of knowing how," it is proposed that children's "theory of knowing that" consists of two major components. Indeed, two theories of knowing are quite similar in structure with the exception that the component of successful action in "theory of knowing how" is replaced with truthfulness in a "theory of knowing that." Again, it is hypothesized that children acquire the two components in sequence of truthfulness followed by access to information. Truthfulness is proposed to be acquired before the other component because it is the easiest for children to judge. As soon as children know the fact about the world (e.g., there is a candy inside a box) they will most likely forget about the source of their knowledge (Fung, 2000), and thus overlook the importance of access to information. Components and the predicted developmental sequence of children's theories of "knowing how" and "knowing that" are summarized in Table 2 and Table 3, respectively.

Table 2
Summary of Children's "Theory of Knowing How" and "Theory of Knowing That"

Components	Knowing How	Knowing That
Successful Action	✓	-
Truthfulness	-	✓
Access to Information	✓	✓

"✓" represents the presence of the component in the concept; "- " represents the absence of the component in the concept.

Table 3
Predicted Developmental Sequence of Children's "Theories of Knowing"

	First Component to Develop	Second Component to Develop
"Knowing How"	Successful Action	Access to Information
"Knowing That"	Truthfulness	Access to Information

In the present study, the three experiments on children's understanding of "knowing how" and "knowing that" relied on knowledge-judgment paradigm. In Experiment 1, we tested children's sensitivity to informational access in the assessment of their own and others' knowledge. In Experiment 2, we examined children's reliance on the other's performance in their attribution of knowledge to others; whereas in Experiment 3, children's understanding of others' "knowing how" and "knowing that" was studied when the children were ignorant.

Our tasks included test questions that address three aspects of knowing- access, performance and, person- by asking children questions about their judgments of knowledge at critical points in both knowing-that and knowing-how tasks. Particularly, we asked children both before and after they had been exposed to critical information if they knew a simple fact or knew how to perform a simple skill. Both of these judgments assessed children's understanding of their current knowledge states. Moreover, in this procedure, if children are sensitive to the issue of access, then they should claim "don't know" on the *pre-exposure* questions. In contrast, after being exposed to the information, they should claim to "know" on the *post-exposure* questions. Assessing the differences between children's claims on these two questions provides us with ideas about their

sensitivity to access as a basis for knowing. Apart from self-knowledge, we are also interested in children's understanding of others' states of knowledge. Similarly, such understanding was examined by children's judgments about others' states of knowledge in critical points of *pre-* and *post-exposure*. Thus, we contrasted children's judgments of self with other for both the knowing-that and the knowing-how tasks.

In Experiment 2, children's sensitivity to performance as a component of knowing was investigated. In order to examine this, children were asked to judge the states of knowledge of others after their performance. Half of the time children were shown a successful performance and half a failure performance. If children are sensitive to performance of others, then they should always attribute knowledge to those who performed successfully but not to those failed. Moreover, we also tested children on false belief tasks which were designed to be parallel to our knowing-that and knowing-how tasks. This provides a comparison task for assessing children's understanding of knowing more broadly constructed.

In summary, the present study was aimed at investigating children's emerging understandings of what it means to "know" for self and other in two types of knowledge ("knowing that" and "knowing how") as well as their sensitivity to access and performance as base of knowing. The test questions asked in the three experiments are summarized in Table 4.

Table 4

Test Questions Asked in the Three Experiments

	Experiment 1	Experiment 2	Experiment 3
Knowing That			
Pre-exposure for Self	+	+	+
Post-exposure for Self	+	+	-
Pre-exposure for Other 1	-	-	+
Post-exposure for Other 1	+	+	+
Post-performance for Other 1	-	+	-
Pre-exposure for Other 2	+	+	+
Post-performance for Other 2	-	+	-
Knowing How			
Pre-exposure for Self	+	+	+
Post-exposure for Self	+	+	-
Pre-exposure for Other 1	-	-	+
Post-exposure for Other 1	+	+	+
Post-performance for Other 1	-	+	-
Pre-exposure for Other 2	+	+	+
Post-performance for Other 2	-	+	-
False Belief			
Pre-exposure for Self	+	+	+
Post-exposure for Self	+	+	-
Pre-exposure for Other 1	-	-	+
Post-exposure for Other 1	+	+	+
Pre-exposure for Other 2	+	+	+

"+" represents the presence of that question; "- " represents the absence of that question.

CHAPTER TWO

Experiment 1

The first step in assessing children's understanding of "knowing how" and "knowing that" as a function of access to information is to determine if they are aware that *pre-exposure* to relevant information is associated with "not knowing" whereas after being exposed to the information, the person could be claimed to "know." We expected that preschool children would gradually have an appreciation of such differences in their states of knowing. To test the hypothesis, 3-, 4- and 5-year-old children were asked to judge their states of knowing in *pre-* and *post-exposure* conditions. Similar questions for <u>others</u> were also asked and their responses were compared with that for themselves.

Method

<u>Participants</u>

A total of 72 children, half boys and half girls, participated in this experiment. The 24 3-year-olds ranged in age from 3-1 to 3-11 (mean age = 3.83, <u>SD</u> = 0.10), the 24 4-year-olds ranged from 4-0 to 4-11 years (mean age = 4.56, <u>SD</u> = 0.29) and the 24 5-year-olds ranged from 5-0 to 5-10 (mean age = 5.31, <u>SD</u>= 0.29). All the participants were attending middle class kindergartens in Shatin, Hong Kong. Parental consent was collected prior to children's participation. This experiment was conducted in a quiet room of the kindergarten in which the children met individually with a post-graduate student for about 10-15 minutes.

<u>Materials</u>

For the knowing-that task, a chest of drawers (10.5 x 10.5 x 3.5 cm) was used. The drawer contained a candy. Children were asked if they knew the contents of the drawer or

not. A Hello Kitty toy acted as the Other 1 (who had access to the contents of the drawer) whereas a Doraemon toy acted as the Other 2 (who did not have access to the contents of the drawer).

For the knowing-how task, a set of two magic markers (a green one and a transparent one) and a blank piece of paper were used. The transparent marker was used to change a line drawn with the green marker into purple. This set of materials was used for a "trick" that the child was asked whether he/ she knew how to do it or not. A Winnie- the-Pooh toy acted as the Other 1 (who had access to the trick) whereas a Tigger toy acted as the Other 2 (who did not have access to the trick).

As for the false belief task ("unexpected contents" task), a cylinder-shaped package of Smarties (40 mm diameter x 20 cm height) with a lid was used. The cylinder contained two pencils. A McDull toy acted as the Other 1 (who had access to the contents of the cylinder), whereas an Ah May toy acted as the Other 2 (who did not have access to the contents of the cylinder).

In addition, there was a set of record sheets (as seen in Appendix A) for marking children's responses in the tasks of "knowing that," "knowing how" and "false belief." Each child participated in all three tasks (knowing-that, knowing-how and false belief), and their order was counterbalanced across children.

Procedure

The structures of the knowing-that and knowing-how tasks were designed to be as parallel as that of Gopnik and Graf's (1988) source knowledge tasks, but with varied types of information: the contents of a set of drawers for the knowing-that tasks and some simple

tricks for the knowing-how tasks. Moreover, the focal questions asked also deviated from Gopnik and Graf's (1988) design in several ways.

In both the knowing-that and knowing-how tasks, the target questions were asked at two separate phases of the task, which were labeled as "pre-exposure" and "post-exposure." The *pre-exposure* questions were aimed at examining children's abilities to correctly state that they "did not know" information that they had not been exposed to. After the children were given the critical information for the task, they were asked the *post-exposure* questions which were about whether or not they knew the information "right now." For the *post-exposure* questions, if children understand the information given to them and are confident of their ability to demonstrate such knowledge, they should claim to "know." However, being exposed to information does not guarantee one "knows" it (Montgomery, 1992); sometimes the information requires further processing in order to be truly known. Thus, other than being asked to state if they "knew" the information or not, the children were also asked to demonstrate their knowledge to the experimenter.

Apart from children's understanding of their own knowledge, their understanding of others' states of knowing was also investigated in this experiment. Similarly, there were *pre-exposure* and *post-exposure* questions for the other. The *pre-exposure* questions were intended to examine children's abilities to correctly state that the other "did not know" information if they had not been exposed to it whereas the *post-exposure* questions were designed to examine children's abilities to state that the other "knew" if they had been given the critical information for the task. A summary of correct responses at the different phrases of the two types of knowing tasks is presented in Table 5, and the details of the knowing-that and knowing-how tasks are presented below.

Table 5
Correct Response Pattern for the Questions in Knowing-How and Knowing-That Tasks

Type of Question	Knowing How	Knowing That
Pre-exposure		
Self ----- "Do you know?"	"Don't know" because probably impossible	"Don't know" because non-descript container
Other 2 ----- "Does he / she know?"	"Don't know" because trick was not revealed to him / her	"Don't know" because he / she didn't have access to the contents
Post-exposure		
Self ----- "Do you know?"	"Know" because trick revealed	"Know" because contents revealed
Other 1 ----- "Does he /she know?"	"Know" because trick revealed	"Know" because contents revealed

(i) Knowing That

In the knowing-that task, the child was first shown a set of drawers and was asked, [Pointing at the drawer] "Do you know what's inside?" At this *pre-exposure* phrase, if the child claimed that he/she "did not know," the experimenter would open the drawer so that the child could see the object inside. However, if the child claimed to "know," he /she would be asked to name what was in the drawer. If he/ she answered incorrectly, s/he would be told, "No, there isn't [X] inside, there is…" and then the experimenter would show the contents to him/ her. After the child had seen the object, the drawer was closed again. At this *post-exposure* phrase, the child was asked if he/she "knew" what was in the drawer to which s/he was just exposed. If the child claimed to "know," s/he was then asked to tell the experimenter what it was to ensure that s/he really knew.

Once the self-part was finished, Other 1 (with access) was introduced to the child. Other 1 was then shown the contents of the drawer. After that, Other 2 (no access) came

out and was portrayed as an ignorant bystander. The child was asked the *pre-exposure* questions for other. The child was asked if Other 2 knew what was inside the drawer. Since Other 1 had been exposed to the contents of the drawer, the child was then asked the *post-exposure* questions for the other. The child was asked if Other 1 knew what was inside the drawer.

(ii) Knowing How

The structure of the knowing-how task was identical to that of the knowing-that task. The knowing-how task was a trick that the children were presumed not to know how to do before being taught by the experimenter. The trick involved changing a green line into a purple line (color-changing task). At the beginning of the task, the child was shown a piece of paper with a green line drawn on it and the two magic markers (one green and one transparent), and was told about the result of the trick. The child was told as follows: *Here's a line. What color is it* (point at line)*? Green... right. Do you know how to change this green line* (point at line again) *into purple?*

The child's answers to this *pre-exposure* question were scored as either "know" or "don't know." For this question, children should have answered "don't know," unless they actually knew how to perform the trick. If the child claimed to "know," he /she would be asked to perform the trick; otherwise, the experimenter would show the child how to perform the trick as follows:

The experimenter used the green pen to draw another line on the paper. Then the experimenter picked up the transparent pen and held it out to make it salient to the child that the transparent pen had been picked up. At last, the experimenter scribbled over the green line and turned it into purple.

After the child was shown how to do the trick, he/she was asked if s/he "knew how" to perform the trick right now, and this was the *post-exposure* question. If child claimed he/she "knew how" to perform the trick, s/he was asked to perform it. His/her performance was coded as either correct or incorrect. If the child said he/she "did not know," the experimenter showed him/her how to perform the trick again and the *post-exposure* question was asked. Once the child's performance was coded, he/she moved on to the other-part.

For the other-part, Other 1 (with access) was first introduced to the child and it was shown how to perform the trick by the experimenter. Then Other 2 (no access) came out. It was portrayed as an ignorant bystander. The child was first asked the *pre-exposure* questions for the other. The child was asked if Other 2 knew how to perform the trick. As Other 1 had been taught how to perform the trick, the child was then asked the *post-exposure* questions for the other. The child was asked if Other 1 knew how to perform the trick.

(iii) False Belief

The false belief task used in this experiment was the unexpected contents task. The child was shown a familiar container of Smarties and asked, "Do you know what's inside?" This *pre-exposure* question is similar to that in the knowing tasks as it asks children to make judgment about their own knowledge of the contents of a container that they have not been exposed to. However, since the label and shape of the container is familiar, children may be confident about the contents of the container. Once the child's response was recorded, Other 1 (with access) was introduced to him/her. Then, both the child and Other 1 were shown the actual unexpected contents of the container. After being

shown the actual contents of the container, the child was asked the *post-exposure* question for self. Thereafter, Other 2 (no access) came out. It was portrayed as ignorant about the task and the child was asked if it knew what was inside the container. Following this *pre-exposure* question for the other, the child was asked if Other 1 knew what was inside the container, and their responses were scored as *post-exposure* question for the other.

Results and Discussion

Pre-Exposure "Knowing How" and "Knowing That"

Before the children were exposed to either the actual procedure for doing the tricks or the contents of the drawers, they were first asked if they "knew" how to do the trick or what was inside the drawer. A correct answer to both of these self *pre-exposure* questions, as shown in Table 5, is "don't know," since there is no way for the child to know how to do the trick or know the contents of the drawer, unless he/she is guessing.

As can be seen in Figure 1, children's judgments for their own knowing-how tended to get more conservative, and thus more accurate, with increasing age. Since the range of this measure was from 0 to 1, the chance level was set as 0.5. One-sample t-tests were run for the means numbers of "know" judgments of each age group to test if they are significantly above or below chance. It was found that the means for the 4- and 5-year-olds were significantly below chance for both of the knowing tasks, $ps<.05$ whereas the means for the 3-year-olds were only significantly below chance for the knowing-that task, $p<.05$.

In order to test children's understanding of others' knowledge, children were asked to judge if Other 2, who was not exposed to the actual procedure for doing the tricks,

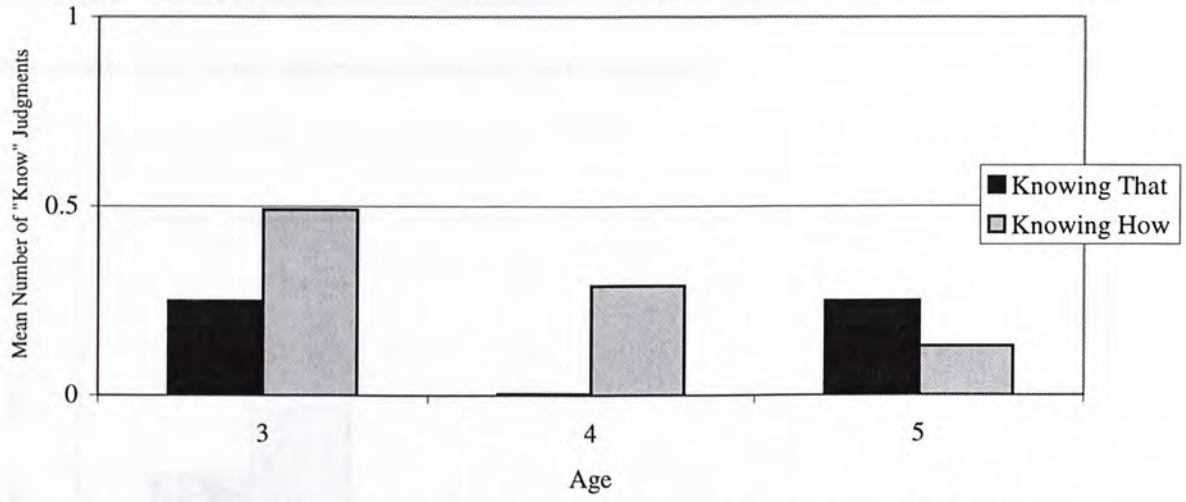

Figure 1. Children's performance on pre-exposure questions for knowing-that and knowing-how for self [Experiment 1].

"knew" how to do the trick and to judge if Other 2, who did not have access to the contents of the drawer, "knew" what was inside the drawer. A correct answer to both of these other *pre-exposure* questions, as shown in Table 5, is "don't know," since neither the trick nor the contents of the drawer were revealed to the puppets. Similar to the pattern for children's own knowledge judgment and as can be seen in Figure 2, children's judgments for both types of others knowing tended to get more conservative, thus more accurate, with increasing age. One sample t-tests were run to test against the chance level of 0.5. It was found that the means for the 4- and 5-year-olds, but not for the 3-year-olds, were below what would be expected by chance for both of these tasks, $ps<.05$.

In order to compare children's *pre-exposure* judgments across the two types of knowing (knowing-that and knowing-how) and person (self and other), a repeated measures analysis of variance was performed for the number of "know" judgments in the knowing-how and knowing-that tasks by age and gender. The only statistically significant

effect was a main effect of age, $F(2, 66) = 5.42$, $p<.01$, which means that children's judgments for both types of knowing, regardless of person, tended to get more conservative and, thus, more accurate with increasing age.

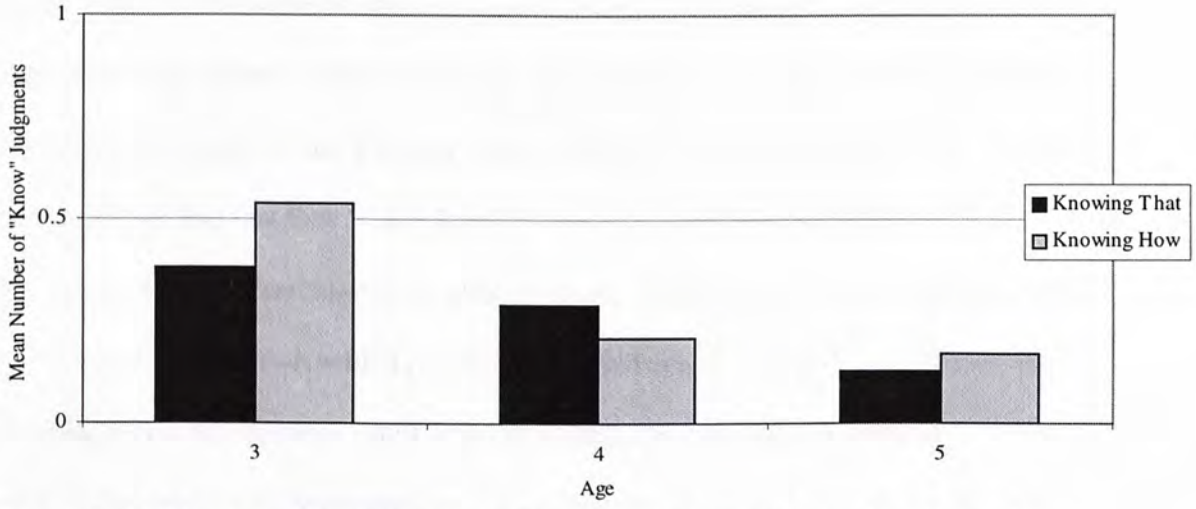

Figure 2. Children's performance on pre-exposure questions for knowing-that and knowing-how for other [Experiment 1].

Post-exposure "Knowing How" and "Knowing That"

As indicated in Table 5, after being exposed to the method for doing the trick or the contents of the drawer, children should answer that they "know" for the *post-exposure* "do you know how/that" questions. In fact, after being shown the trick and being exposed to the contents of the drawers, almost all of the children, no matter which age group they belonged to, claimed to "know."

However, to be credited with an understanding of "knowing," children are required to differentiate states of knowing from states of "not knowing" (Bartsh & Wellman, 1995). If they understand such a difference, children should be able to use the word "know" discriminately. Thus, they should claim to "know" more often in the *post-exposure*

questions than in the *pre-exposure* questions. In order to examine this, a difference score between children's answers on both the *pre-* and *post-exposure* questions was constructed. If children used the word "know" correctly, they should use it only for the *post-exposure* and not the *pre-exposure* questions. To measure such discriminate use, any judgment of "know" was given a score of one and any judgment of "not know" was given a score of zero, regardless of the question. Next, the *pre-exposure* scores were subtracted from the *post-exposure* scores. Thus, if children answered that they "know" correctly in the *post-exposure* trial, and that they "don't know" in the *pre-exposure* trial, they would get a score of 1 – 0 =1 for this *discriminate knowing measure*. Theoretically, scores on this measure could vary from +1 to –1, with a positive score meaning the children said "know" more after exposure (appropriate), and a negative score indicating that children said "know" more before exposure (inappropriate). As can be seen in Figure 3, the means for this measure were all above zero, indicating that even the 3-year-olds were more likely to claim knowledge, for both "knowing how" and "knowing that," after exposure to the relevant information, than before exposure.

Apart from children's own states of knowing, children were also asked to judge if Other 1, who was exposed to the actual procedure for doing the tricks, "knew" how to do the trick; and to judge if Other 1, who had access to the contents of the drawers "knew" what was inside the drawer. In order to demonstrate the ability to distinguish "knowing" to "not knowing" among <u>others</u>, children should have attributed "know" more often to Other 1 (who had been exposed to the trick / contents of the drawer) than to Other 2 (who was not exposed to either the trick / contents of the drawer). Thus, a difference score, parallel

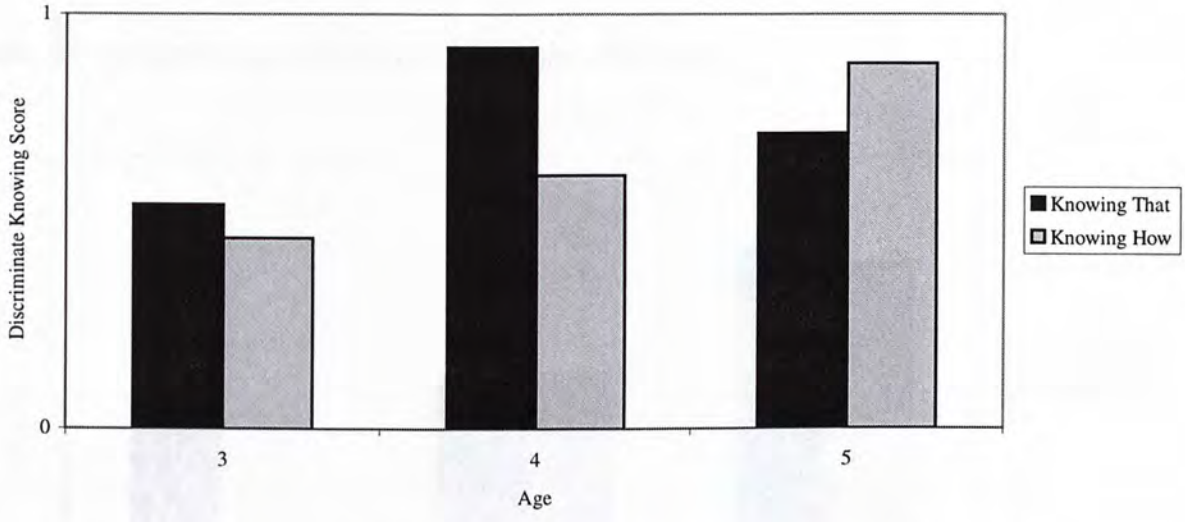

Figure 3. Children's performance on discriminate post versus pre-exposure score for knowing-that and knowing-how (self) [Experiment 1].

to the self *discriminate knowing score*, was constructed from children's attribution of knowing to Other 1 and Other 2. If children used the word "know" correctly, they should have used it only for Other 1 (exposed) and not for Other 2 (not exposed). To measure such discriminate use, any judgment of "know" was given a score of one and any judgment of "not know" was given a score of zero, regardless of the question. Next, the Other 2 scores were subtracted from the Other 1 scores. Thus, if children answered that Other 1 "know" correctly, and that Other 2 "doesn't know", they would get a score of 1 – 0 =1 for this *discriminate knowing measure*. As with the self *discriminate knowing measures*, scores on this measure could vary from +1 to –1, with a positive score indicating more (appropriate) use of "know" for Other 1 and a negative score indicating more (inappropriate) use of "know" for Other 2.

As can be seen in Figure 4, the means for this measure are all above zero (chance level), indicating that children were more likely to attribute knowledge, for both "knowing

how" and "knowing that," to Other 1 (who had access to the relevant information), than Other 2 (who did not have access to the relevant information).

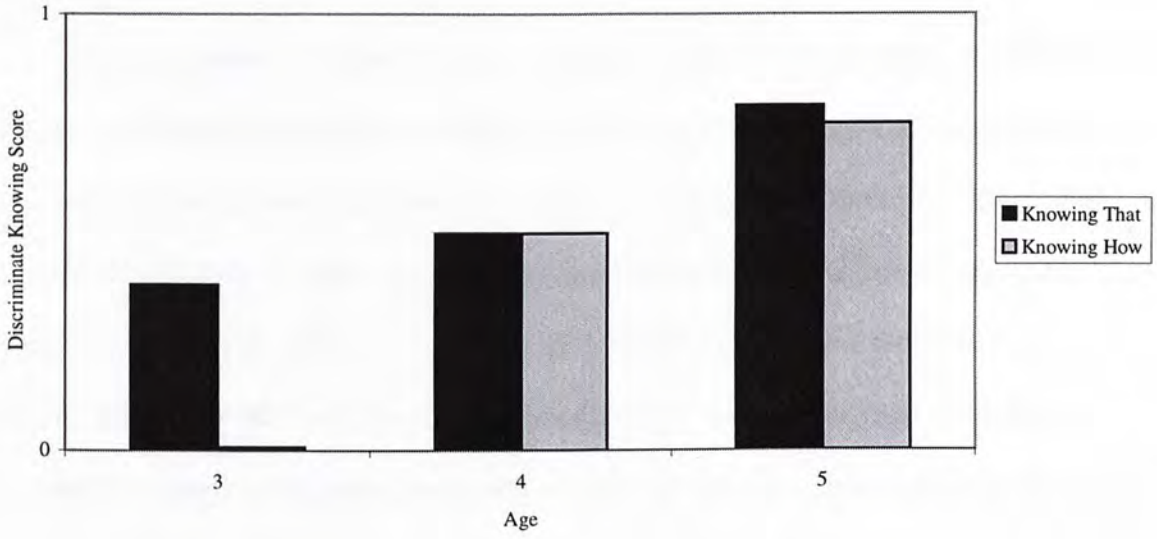

Figure 4. Children's performance on discriminate post versus pre-exposure score for knowing-that and knowing-how (other 1- other 2) [Experiment 1].

In order to compare children's discriminating judgments across the two types of knowing (knowing-that and knowing-how) and person (self and other), a repeated measures analysis of variance was performed for the *discriminate knowing score* in the knowing-how and knowing-that tasks by age and gender. As can be seen in Figures 3 and 4, children's performance on the *discriminate knowing score* for both types of knowing tended to be more accurate with increasing age, $\underline{F}(2, 65)=10.94$, $\underline{p}<.001$, and children were more accurate with the knowing-that task than they were with the knowing-how task, $\underline{F}(1, 65)= 4.09$, $\underline{p}<.05$. Moreover, children were more accurate with <u>self</u> judgment than with that of the <u>other</u>, $\underline{F}(1, 65)= 7.99$, $\underline{p}<.01$. No interactions between any of these factors were found. Thus, the *discriminate knowing measure* was able to demonstrate sensitivity to both person (<u>self</u> judgments better than <u>other</u>) and task (knowing-that better than knowing-

how), with children's judgments of knowing as a function of exposure to information becoming more accurate over the preschool years.

False Belief Tasks

The self-questions for the unexpected contents task were comparable to that of the knowing-how and knowing-that tasks since they asked children to state their own belief before and after being exposed to the contents of the Smarties box. Indeed, this false belief task could be regarded as a knowing-that task except the label and shape of the Smarties cylinder may have given children some clues (though misleading) about the contents. Since the appearance of the drawers in the knowing-that task would not give children any hints about its contents, children's judgments about their own pre-exposure knowledge in the false belief task may have been influenced by this factor.

As with the knowing-how and knowing-that tasks, before the children were exposed to the contents of the Smarties box, the children were first asked if they "knew" what was inside the box. For this self *pre-exposure* question, the "correct" answer is quite ambiguous: if the task is regarded as a "real" false belief task, without doubt the correct answer should be "know"; however, if it is treated as an alternative knowing-that task, then children who answer "don't know" could also be considered as correct since they may have doubt or uncertainty about the contents of the Smarties box. Here, the structure of the false belief task was designed to be parallel to that of the knowing-that tasks and it was aimed at examining children's understanding of knowing rather than thinking. Thus, the scoring rules of the knowing-that tasks should be applicable to the false belief task as well. As for the other's "pre-exposure" belief, children were asked to judge if Other 2, who did not have access to the contents of the Smarties box, "knew" what was inside the box. A

correct answer to this other *pre-exposure* questions is "don't know," since the contents of the Smarties box were not revealed to the puppet. Similarly, after being exposed to the contents of the Smarties box, children should have answered that they "know" for the self *post-exposure* question. As for the other *post-exposure* question, children should also have answered that Other 1, who was exposed to the contents of the Smarties box, "know" since the contents of the box were revealed to him as well.

In order to compare children's judgments across person (self and other), a repeated measures analysis of variance was performed for the *discriminate scores* in the false belief task by age and gender. The *discriminate score* was calculated in the same way as those in the knowing-how and knowing-that tasks. That is, any judgment of "know" was given a score of one and any judgment of "not know" was given a score of zero, regardless of the question. Then, the *pre-exposure* scores were subtracted from the *post-exposure* scores. Thus, if children answered "know" in the *post-exposure* trial, and "don't know" in the *pre-exposure* trial, they would get a score of $1 - 0 = 1$ for the *discriminate measure*. Theoretically, scores on this measure could vary from +1 to –1, with a positive score meaning the children said "know" more in the *post-exposure* question, and a negative score indicating that children said "know" more in the *pre-exposure* question. As can be seen in Figures 5, children's tended to claim "know" more in the *post-exposure* questions, with increasing age, $F(2, 66)=9.22$, $p<.001$, and there was a age by person interaction, $F(2, 66)=3.17$, $p<.05$, which appears to be located primarily in the 5-year-olds who performed much better for others than self judgments while the 3- and 4-year-olds had better judgments for self than others. Moreover, except for the 3-year-olds in other's judgments,

children's performance, regardless of person, were all significantly above the chance level of zero, $p<.01$.

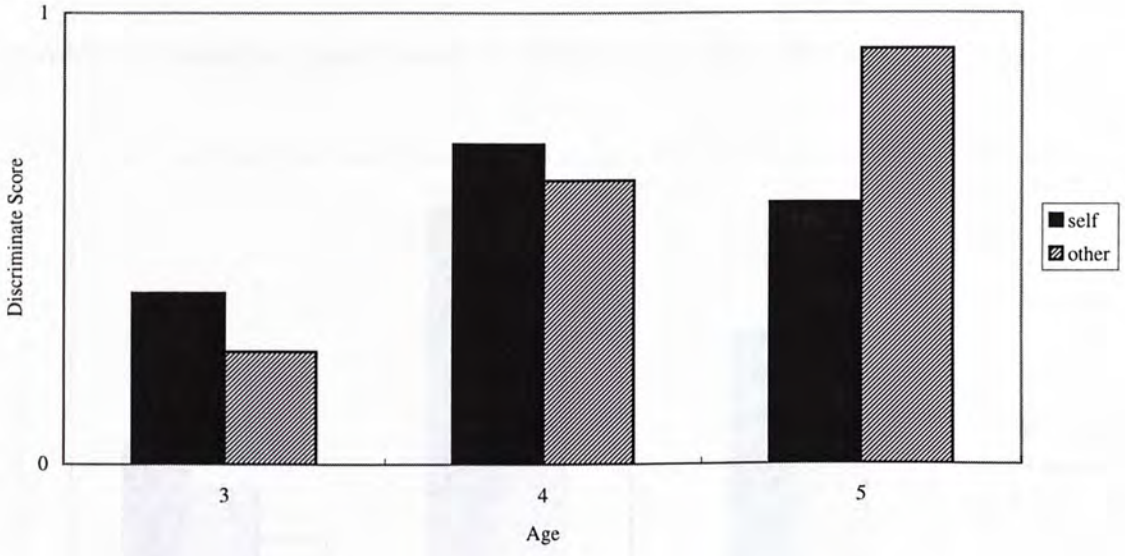

Figure 5. Children's performance on discriminate post versus pre-exposure score in the false belief task for self and other [Experiment 1].

Overall Performance on Knowing How, Knowing That, and False Belief

In order to compare children's overall performance across the 3 tasks (knowing how, knowing that and false belief), it was important to incorporate a score that would be comparable in scale and measure the fundamental aspects of each concept. Thus, the *discriminate score* calculated by subtracting the children's pre-exposure responses from their post-exposure responses in each concept seemed to be the best choice.

Children's *discriminate scores* for each concept were analyzed together in a repeated measures analysis of variance examining the effects of concept, person, age, and gender. There was a main effect of age, $F(2, 65) = 6.83$, $p<.001$, with children's performance increasing steadily with age, and there was a marginally significant effect of person, $F(1, 65)= 3.69$, with children's judgments better for self than other. As can be

seen in Figure 6, similar developmental patterns were found in children's performance on the self judgment in the knowing-that and the false belief task: the 4-year-olds did the best, followed by the 5-year-olds; the 3-year-olds did the worst. Instead, there was a linear improvement in children's judgments in the knowing-how task across age.

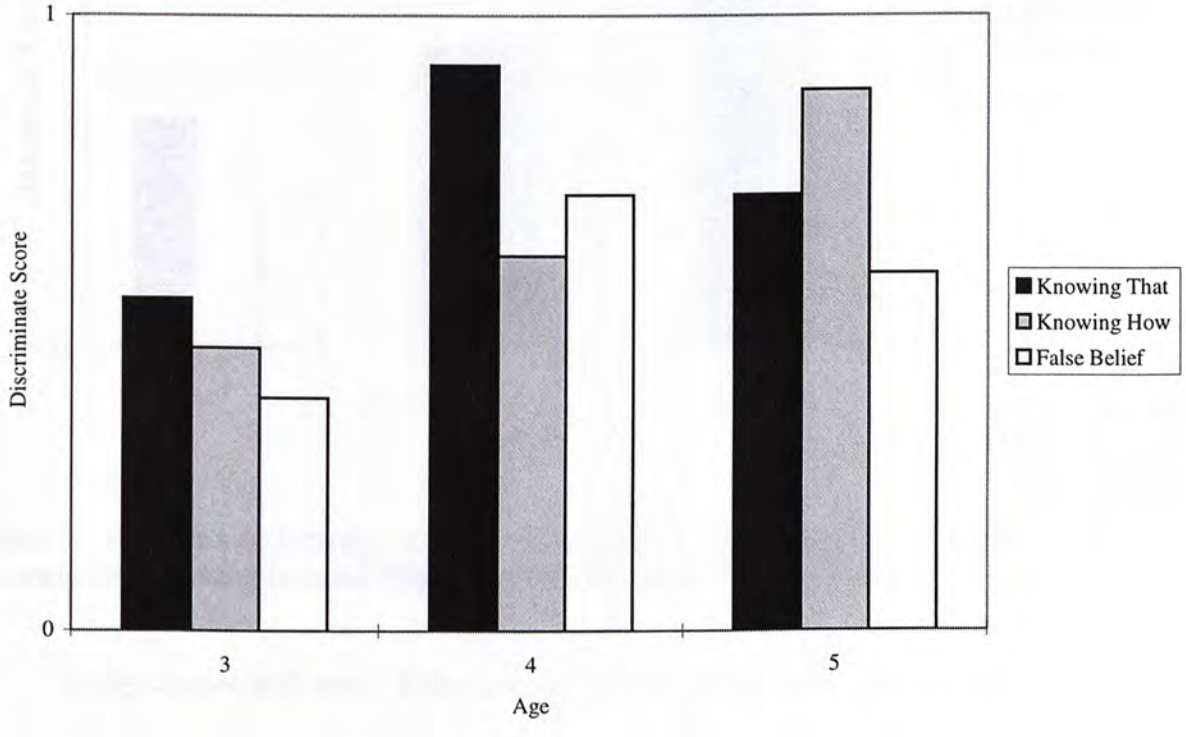

Figure 6. Children's performance on discriminate post versus pre-exposure score for knowing-that, knowing-how and false belief (self) [Experiment 1].

As can be seen in Figure 7, the 3-year-olds' performance on the other's judgment was not significantly above the chance level of zero in the knowing-how and the false belief task; however, their performance on the knowing-that task was significantly above the chance level of zero, $p<.01$. Children's judgments about the other's "knowing how" and "knowing that" were more or less the same among the 4- and 5-year-olds; yet, the 3-year-olds seemed to have some difficulties in their judgment of the other's "knowing how."

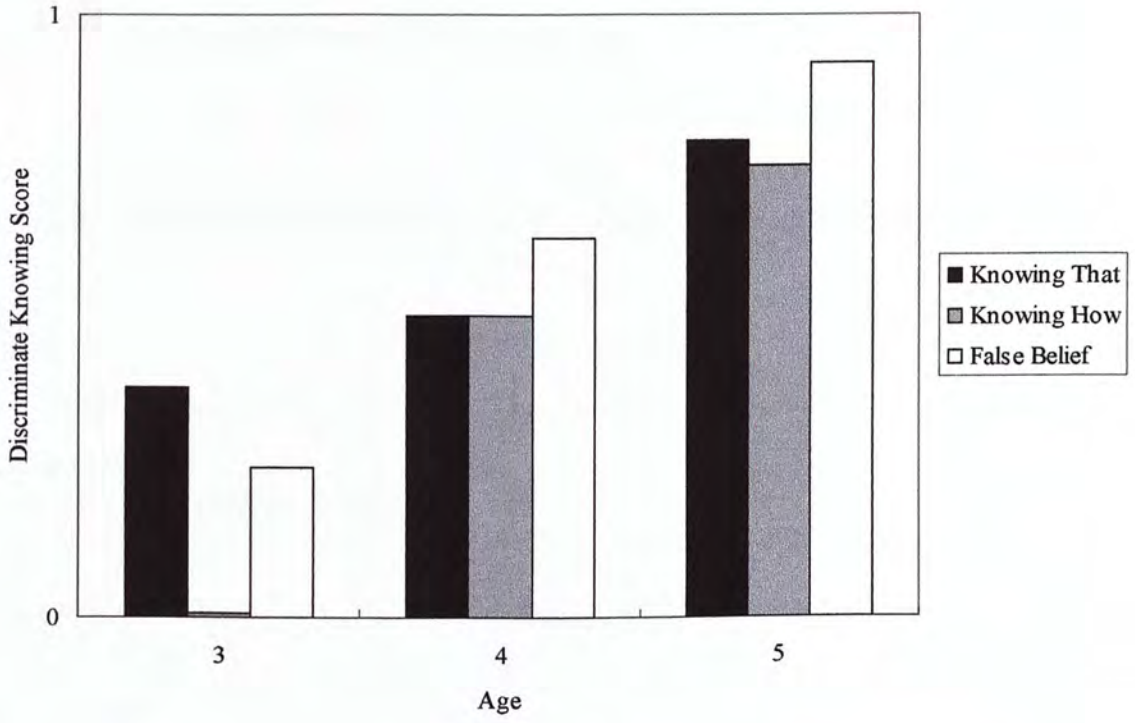

Figure 7. Children's performance on discriminate post versus pre-exposure score for knowing-that, knowing-how and false belief (other1 – other 2) [Experiment 1].

Using *discriminate scores* helps make comparisons more valid. However, such scores did not reveal pattern of children's error. For example, the same score could result from two very different errors: children who scored zero in the *discriminate score* could mean they got the *post-exposure* answer right but the *pre-exposure* wrong (i.e., 1-1= 0), or they got the *post-exposure* answer wrong but the *pre-exposure* right (i.e., 0-0= 0). In order to have an idea about children's pattern of errors, Table 6 showed the number of children who responded in particular pattern in the *pre-* and *post-exposure* questions. As can be seen in Table 6, children who scored zero in the *discriminate score* were likely getting the *post-exposure* question right but erred in the *pre-exposure* questions (i.e., 1-1= 0).

Inferring from this, children seemed to have more difficulty in understanding *pre-exposure* state of knowing than they were in *post-exposure* state.

Table 6
Number of Children Responding in Pre- and Post-Exposure Questions [Experiment 1]

	Self			Other		
	Age			Age		
	3	4	5	3	4	5
Knowing How						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	12	14	21	5	13	19
D - D (0-0 = 0)	1	3	-	6	6	1
K - K (1-1 = 0)	10	6	3	10	4	3
D – K (0-1 = -1)	1	-	-	3	1	1
Knowing That						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	14	22	17	10	13	20
D - D (0-0 = 0)	4	1	1	5	4	1
K - K (1-1 = 0)	5	1	6	8	6	2
D – K (0-1 = -1)	1	-	-	1	1	1
False Belief						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	10	17	14	9	15	22
D - D (0-0 = 0)	1	-	1	5	5	-
K - K (1-1 = 0)	12	7	9	7	4	2
D – K (0-1 = -1)	1	-	-	3	-	-

"D" represents "don't know"; "K" represents "know."

CHAPTER THREE

Experiment 2

In Experiment 1, children demonstrated their sensitivity to access to information as a basis of knowing. In Experiment 2, children's understanding of knowing was examined in terms of performance and access. The structures of the tasks were basically the same as those adopted in Experiment 1, except performances of other were included and the false belief task adopted here was really a test of false belief. In order to test the possibility that children's attribution of knowledge was mainly based on performance rather than access to relevant information, children were asked to judge others' state of knowing after performances were shown. If children vary their answers about a person's knowledge as a function of the person's performance, they would attribute knowledge more often to people who showed successful performance.

Method

Participants

A total of 72 children, half boys and half girls, participated in this experiment. The 24 3-year-olds ranged in age from 3-1 to 3-11 (mean age = 3.71, SD = 0.22), the 24 4-year-olds ranged from 4-0 to 4-11 years (mean age = 4.50, SD = 0.26) and the 24 5-year-olds ranged from 5-0 to 5-10 (mean age = 5.37, SD= 0.23). All the participants were attending middle class kindergartens in Shatin, Hong Kong. Forty-seven of the participants had participated in Experiment 1 earlier, but the two experiments were conducted at least a month apart. This experiment was conducted in a quiet room of the kindergarten in which the children were interviewed by a post-graduate student. The children were tested

individually for about 15-20 minutes. Parental consent was collected prior to children's participation.

Materials

For the knowing-that tasks, a chest of drawers (10.5 x 10.5 x 3.5 cm each) was used. The upper drawer contained an eraser while the lower drawer contained a toy car. Children were asked if they knew the contents of the drawers or not. For the first trial, a Hello Kitty toy acted as the Other 1 (who had access to the contents of the drawer) whereas a Doraemon toy acted as the Other 2 (who did not have access to the contents of the drawer). For the second trial, a Mickey Mouse toy acted as the Other 1 whereas a Goofey toy acted as the Other 2.

For the knowing-how tasks, There were two sets of materials: (1) a toy with plastic ants inside (Moving Ants task); the ants inside could be moved by pulling the button in the back of the toy forward and backward (2) a toy with eyes that could flash (Flashing Eyes task) when its tail was pulled. Each set of materials was used for a "trick" that the child was asked whether he/ she knew how to do it or not. For the Moving Ants task, a Doraemon toy acted as the Other 1 (who had access to the trick) whereas a Hello Kitty toy acted as the Other 2 (who did not have access to the trick). For the Flashing Eyes task, a Goofey toy acted as the Other 1 whereas a Mickey Mouse acted as the Other 2.

As for the false belief task (the "unexpected contents" task), a box of colored pencils was used. The box contained bandages. A McDull toy acted as the Other 1 (who had access to the contents of the box) whereas the Ah May toy acted as the Other 2 (who did not have access to the contents of the box).

In addition, there was a set of record sheets (as seen in Appendix B) for marking children's responses in the tasks of "knowing that," "knowing how" and "false belief." Each child participated in all three tasks (knowing-that, knowing-how and false belief) and their order was counterbalanced across children.

Procedure

In both the knowing-that and knowing-how tasks, the target questions were asked at three separate phases of the task: *pre-exposure*, *post-exposure* and *post-performance*. Since it is difficult to control children's successfulness in doing a particular task, an experimental target's successfulness in performance is preferred as it can be easier to manipulate. As in Experiment 1, the *pre-exposure* and *post-exposure* questions were asked for both self and other; whilst the *post-performance* questions were asked for other only. Details of the knowing-that and knowing-how tasks are presented below.

(i) Knowing That

The procedure for the knowing-that task for self was identical to that in Experiment 1. Before the child had access to the contents of the drawers, he/she was asked the *pre-exposure* question for self; after being shown the contents, he/she was asked the *post-exposure* question for self. After that, Other 1 was introduced to the child and it was shown the contents of the drawers. Since the Other 1 had been exposed to the contents, *post-exposure* question for other were asked. Then, the experimenter would turn to Other 1 and ask if it knew the contents of the drawer. The Other 1 would then whispered to the experimenter and the experimenter would reply, "I see." If it was the condition of successful action, the experimenter would tell the child, "_____(Other 1)said there's a(n) [eraser / toy car] inside." If it was the condition of failure action, the experimenter would

tell the child, "_____(Other 1) said there's a [ruler / comb] inside." Being told about the responses of Other 1, the child was asked if Other 1 knew what was inside the drawers. This was the *post-performance* question for Other 1. Once the child's response was recorded, he/she proceeded to the questions for Other 2.

Other 2 was portrayed as an ignorant bystander. The experimenter asked the child if Other 2 knew what was inside the drawer. Since Other 2 had not been exposed to the contents, the *pre-exposure* questions for other were asked. Then, the experimenter would turn to Other 2 and ask if it knew the contents of the drawer. Again, the Other 2 whispered to the experimenter and the experimenter would reply, "I see." For the condition of successful action, the experimenter would tell the child, "Other 2 said there's a(n) [eraser / toy car] inside." As for the condition of failure action, the experimenter would tell the child, "Other 2 said there's a [ruler / comb] inside." The *post-performance* question for Other 2 was then asked of the child. Since the performance condition was a within-subjects manipulation, all children received two trials in total, one trial in each of the success and the failure conditions for the Other 1 and the Other 2 respectively, with the pairing of conditions to drawers counterbalanced across participants.

(ii) Knowing How

The knowing-how tasks consisted of two simple tricks that children were presumed not to know how to do before being taught by the experimenter. One of the tricks involved making the plastic ants inside a toy move while the other trick involved making the eyes of a toy flash. Each child received both tasks and their order was counterbalanced across children. The procedure for the knowing-how task for self was identical to that in Experiment 1. Before the child had access to the tricks, he/she was asked the *pre-exposure*

question for self; after being shown how to perform the trick, s/he was asked the *post-exposure* questions for self. As for the other-part, the structure was identical to that of the knowing-that task.

For the other-part, Other 1 was introduced to the child and it was taught how to perform the tricks. Since the Other 1 had been exposed to the tricks, the *post-exposure* question for other was asked. Then, the experimenter asked the Other 1 if it knew how to perform the tricks. The Other 1 then whispered to the experimenter and the experimenter would reply, "I see. Maybe you can try to do it." If it was the condition of successful action, the experimenter held the hand of the Other 1 and performed the tricks by pulling the button behind the toy forward and backward (Moving Ants task) or pulling on the tail of the toy (Flashing Eyes task). If it was the condition of the failure action, the experimenter would hold the Other 1 walking around on the table without pulling the button behind the toy (Moving Ants task) or touching the eyes of the toy without pulling the tail of the toy (Flashing Eyes task). Being shown the performances of the Other 1, the child was asked if the Other 1 knew how to perform the trick and this was the *post-performance* question for Other 1. Once children's responses were recorded, they proceeded to the questions for the Other 2.

Other 2 was portrayed as an ignorant bystander and the experimenter asked the child if Other 2 knew how to perform the tricks. Since Other 2 had not been exposed to the tricks, the *pre-exposure* questions for other were asked. Then, the experimenter turned to Other 2 and asked if it knew how to perform the tricks. Again, the Other 2 whispered to the experimenter and the experimenter would reply, "I see. Maybe you can try to do it." For the condition of the successful action, the experimenter would hold the hand of the

Other 2 and perform the tricks by pulling the button behind the toy forward and backward (Moving Ants task) or pulling on the tail of the toy (Flashing Eyes task). If it was in the condition of the failure action, the experimenter would hold the Other 2 walking around on the table (Moving Ants task) or touching the eyes of the (Flashing Eyes task). After the performances of Other 2 were demonstrated, the *post-performance* question for Other 2 was asked.

(iii) False Belief

The false-belief task used in this experiment was the unexpected contents task. The child was shown a familiar box of colored pencils and asked, "Do you know what's inside?" This *pre-exposure* question for self was identical to that in the Experiment 1. Since the label and shape of the box were familiar, almost all of the children responded with the actual contents. Once the child's responses were recorded, he/she was then shown the actual unexpected contents (bandages) of the box. After being shown the contents, he/she was asked the about the *post-exposure* question for self. In addition, he/she was asked the *false belief* test question, "before I open this for you to have a look, do you know what's inside this box?" This question requires children to make judgments of their own prior knowledge state.

Apart from the self-judgment, children were also asked to make judgments about the other in the false belief task. Other 1 (with access) was first introduced to the children and it was shown the actual unexpected contents of the colored pencils box. After that, children were asked the *post-exposure* question for other. Thereafter, Other 2 (no access) came out. It was portrayed as ignorant about the task. The child was told that Other 2 had

never seen inside the box, and asked if it knew what was inside the box. This was the *pre-exposure* question for other.

Results and Discussion

Discriminate Measure of "Knowing How," "Knowing That"

Replicating Experiment 1 with a new sample, a repeated measures analysis of variance was performed for the *discriminate knowing score* in the knowing-how and knowing-that tasks for both self and other by age and gender. The *discriminate knowing score* was calculated as those in Experiment 1: any judgment of "know" was given a score of one and any judgment of "not know" was given a score of zero, regardless of the question. Next, the *pre-exposure* scores were subtracted from the *post-exposure* scores. Thus, if children answered that they "know" correctly in the *post-exposure* trial, and that they "don't know" in the *pre-exposure* trial, they would get a score of 1 – 0 =1 for this *discriminate knowing measure*. Theoretically, scores on this measure could vary from +1 to –1, with a positive score meaning the children said "know" more after exposure (appropriate), and a negative score indicating that children said "know" more before exposure (inappropriate). As can be seen in Figures 8 and 9, similar to what was found in Experiment 1, children's performance on the *discriminate knowing score* for both types of knowing tended to be more accurate with increasing age, $F(2, 57) = 12.48$, $p<.001$. As Experiment 1 demonstrated, children's judgments were better for self than other, $F(1, 57) = 15.43$, $p<.001$, and were more accurate with the knowing-that task than with the knowing-how task, $F(1, 57) = 3.91$, $p<.05$. However, unlike Experiment 1, two other interaction effects also became evident in this experiment. The first one was a person by age interaction, $F(2, 57) = 4.02$, $p<.05$, which as can be seen in the Figures, appeared to be located in the 5-

year-olds who performed much better for other in the knowing-that task. Second, there was a concept by age interaction, $F(2, 57) = 3.49$, $p<.05$, which can be seen in Figure 8, seemed to be located in the 5-year-olds whose judgments were better in the knowing-how task than in the knowing-that task.

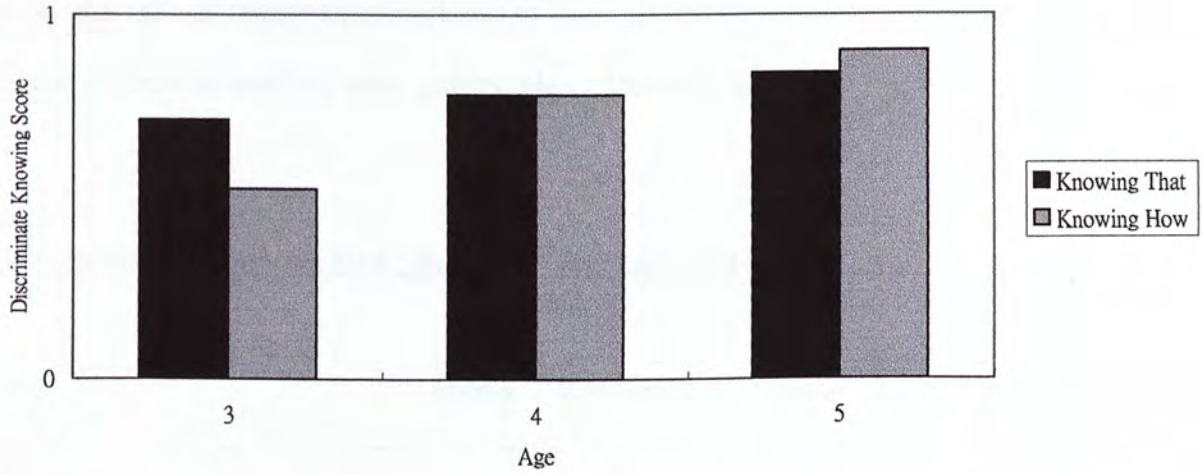

Figure 8. Children' s performance on discriminate post versus pre-exposure score for knowing-that and knowing-how (self) [Experiment 2].

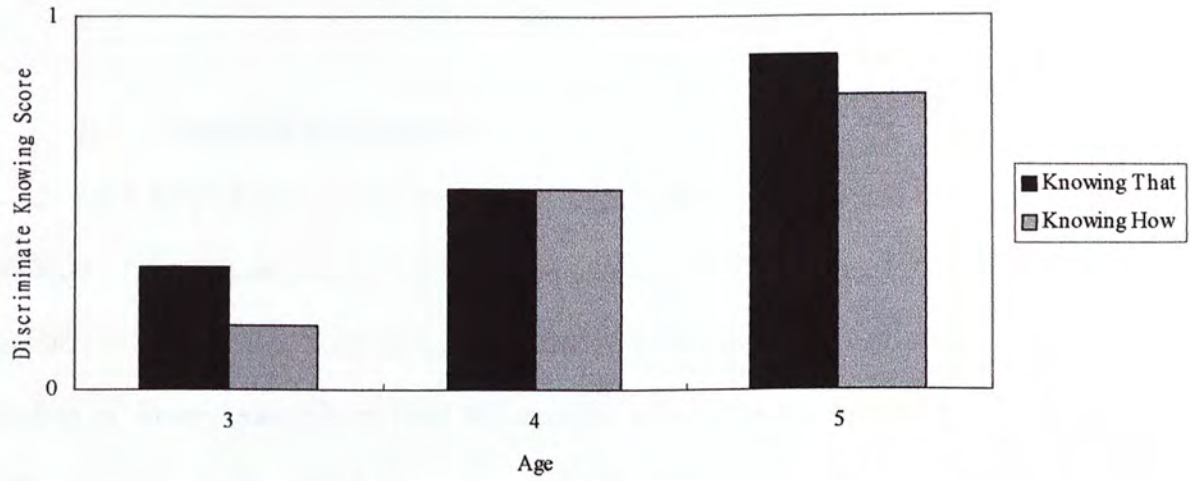

Figure 9. Children' s performance on discriminate post versus pre-exposure score for knowing-that and knowing-how (Other 1- Other 2) [Experiment 2].

Performance as an Indicator for Knowing

In order to investigate whether children would regard access or performance as an indicator of knowing, Other 1 (who had access to the tricks and the contents of the drawers) and Other 2 (who did not have access to the tricks and the contents of the drawers) were manipulated to have either successful or failed performances for each knowing-how and knowing-that task. In other words, as shown in Table 7, there were four conditions for each type of knowing and they were counterbalanced among children.

Table 7
Conditions for the "Knowing How" and "Knowing That" Tasks

	Other 1		Other 2	
	Access	Performance	Access	Performance
Condition 1	+	+	-	-
Condition 2	+	+	-	+
Condition 3	+	-	-	-
Condition 4	+	-	-	+

"+" represents the presence of access / success in performance; "- " represents the absence of access / failure in performance.

(i) Successful Performance

After the performance of Other 1 (with access) was shown, children were asked if the Other 1 "knew" how to do the trick or what was inside the drawer again. In the condition of successful performance, an expected answer to this *post-performance* question, is "know," since Other 1 had the access to information and successful performance was demonstrated. As can be seen in Figure 10, almost all of the children,

regardless of their age, attributed knowledge (knowing-how and knowing-that) to the Other 1 after being shown a successful performance.

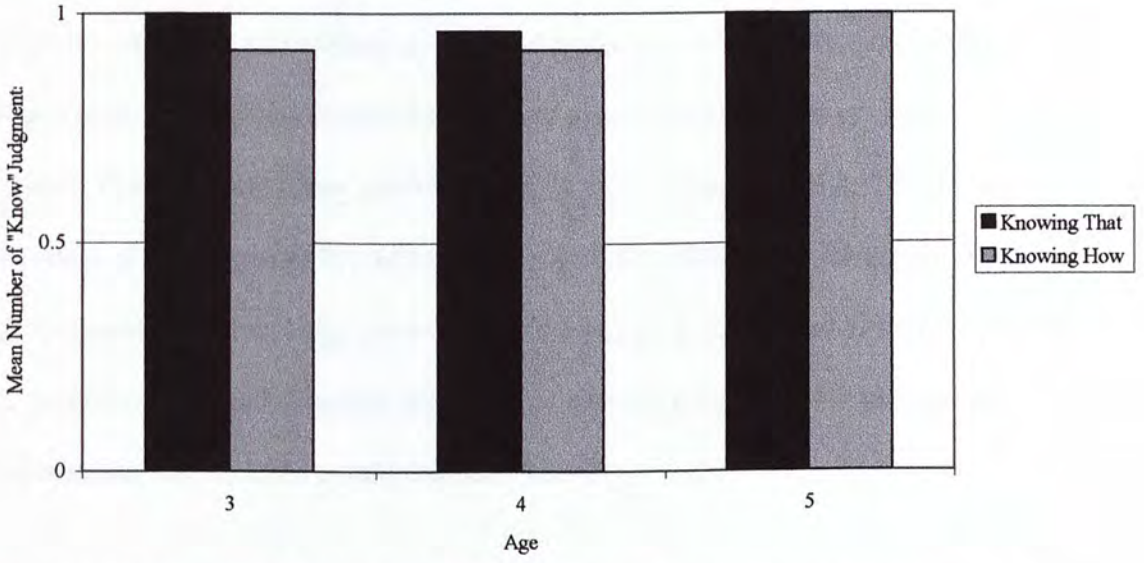

Figure 10. Children's Attribution of "Know" to Other 1 (with access) after Successful Performance in Knowing That and Knowing How Tasks [Experiment 2].

Similarly, after the performance of Other 2 (no access) was shown, children were asked if the Other 2 "knew" how to do the trick or the contents of the drawer. The implication of children's answer to this *post-performance* question was somehow different from what was stated above. Since the Other 2 did not have access to the relevant information, after being shown a successful performance, if children attributed knowledge to the Other 2, then the children probably attributed knowledge based on other's performance without regarding the factor of access to information. On the other hand, if the children took both access to information and successful action into consideration when they attributed knowledge to <u>others</u>, then the children should claim the Other 2 as "doesn't know." As can be seen in Figure 11, almost all of the children, regardless their age,

attributed knowledge (knowing-how and knowing-that) to the Other 2 after being shown a successful performance.

In order to compare children's judgments of other's knowledge across the two types of access (with access and without access) and performance (successful and failed), a repeated measures analysis of variance was performed for the number of "know" judgments in the knowing-how and knowing-that tasks by age and gender. There was a main effect of performance, $F(1, 66) = 349.36$, $p<.001$, which indicated that children's judgment of other's knowledge were mainly based on performance: whenever the puppet demonstration a successful action, regardless of whether it has access to the relevant information or not, children would attribute "know."

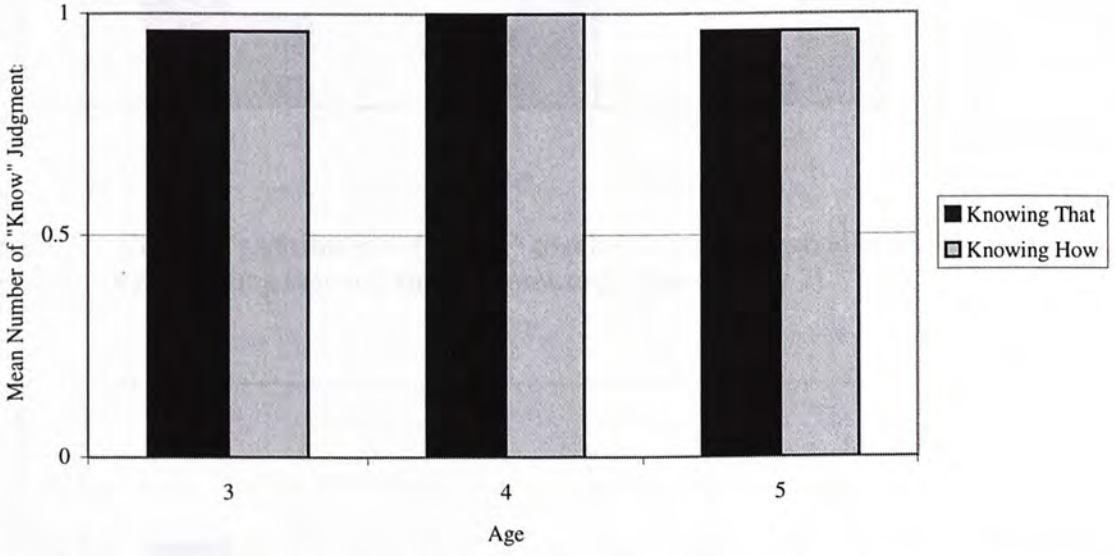

Figure 11. Children's attribution of "know" to other 2 (no access) after successful performance in knowing that and knowing how tasks [Experiment 2].

(ii) Failed Performance

After being shown a failed performance, no matter whether the puppet had or did not have access to the trick or the contents of the drawer, children were expected to claim that

other "don't know" for the *post-performance* question. As can be seen in Figures 12 and 13, the means for the 4- and 5-year-olds were significantly below chance level of 0.5 for the knowing-that tasks, regardless of whether these were with (Other 1) or without access (Other 2), ps< .05. Moreover, the mean for the 5-year-olds for the Other 2 (no access) in the knowing-how task was also significantly below chance, p<.05. However, the mean for the 3-year-olds was only significantly below chance for the Other 1 (with access) in the knowing-how task.

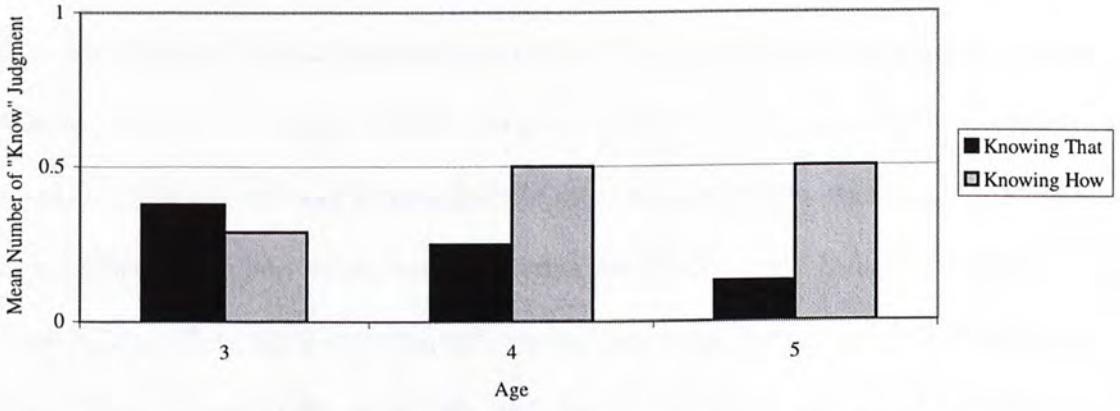

Figure 12. Children's attribution of "know" to other 1 (with access) after failed performance in knowing that and knowing how tasks [Experiment 2].

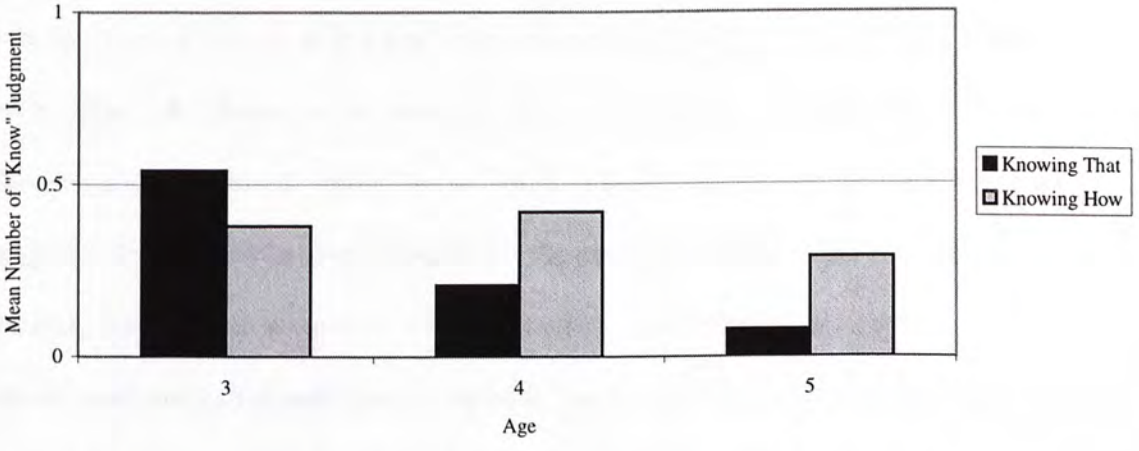

Figure 13. Children's attribution of "know" to other 2 (no access) after failed performance in knowing that and knowing how tasks [Experiment 2].

However, being able to have an appropriate attribution of knowledge to others, children are required to differentiate other's successful performance from the failed ones. If they understanding such a difference, children should be able to use the word "know" discriminately. Thus, they should attribute "know" more often for the one with successful performance than those with failed performance. In order to examine this, a difference score between children's answers on the *post-performance* questions for the puppets who demonstrated successful and failed performance was constructed. If children attribute "know" correctly, they should only attribute knowledge to those who showed successful performance but not those with failed performance. To measure such discriminate use, any attribution of "know" in the *post-performance* questions was given a score of one and any attribution of "not know" was given a score of zero. Next, the *post-performance* score of the successful puppet was subtracted from that of the failed puppet. Thus, if children attributed "know" correctly to the puppet who had successful performance, and that they attribute "don't know" to the puppet who had failed performance, they would get a score of 1 – 0 =1 for this *discriminate performance measure*. Since there were two tasks for each type of knowing (knowing-how and knowing-that), theoretically, scores on this measure could vary from +2 to –2, with a positive score meaning the children attributed "know" more to those who showed a successful performance (appropriate), and a negative score indicating that children attributed "know" more to those who showed failed performance (inappropriate). As can be seen in Figure 14, the means for this measure were above zero, indicating that children were more likely to attribute knowledge to those who demonstrated successful performance for both "knowing how" and "knowing that."

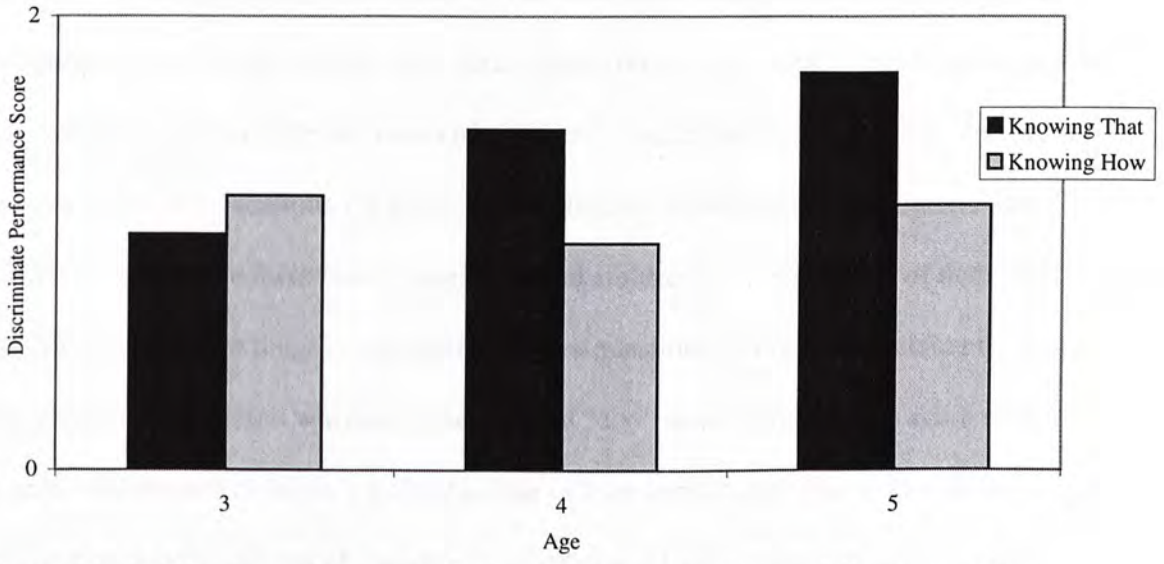

Figure 14. Children' s performance on discriminate success versus failure score for knowing-that and knowing-how for others [Experiment 2].

In order to compare children's discriminating attribution across the two types of knowing (knowing-that and knowing-how), a repeated measures analysis of variance was performed for the *discriminate performance score* in the knowing-how and knowing-that tasks by age and gender. There was a main effect of concept, $F(1, 66) = 6.84$, $p<.05$, which indicated that children's attribution of knowledge to others were more accurate with the knowing-that task than they were with the knowing-how task.

False Belief Task

The false belief task adopted here was different from the one used in the Experiment 1 as it was a "real" false belief task- the children were asked, "before I open this for you to have a look, do you know what's inside this box?" A correct answer for this *false belief test question* is "don't know," since before being shown about the unexpected contents, children should not know what exactly inside the box. Children who

answered this *false belief test question* correctly was given a score of one whereas those answered it wrongly was given a score of zero. Children's performance on this *false belief test question* was comparable to their performance on *pre-* and *post-exposure* questions for self, and they gave us different views of children's understanding of knowing. The *pre-* and *post-exposure* questions for self revealed children's understanding of current states of knowing whereas the *false belief score* indicated children's understanding of their prior state of knowing. For the *pre-* and *post-exposure* questions, children who claimed "know" was given a score of one whereas those claimed "don't know" was given a score of zero. In order to compare children's understanding of their current and prior states of knowing, a repeated measures analysis of variance was performed for the three scores by age and gender. As can be seen in Figure 15, children's performance on the three questions become better with increasing age, $F(1, 62)= 4.86$, $p<.05$. Moreover, a main effect of question was found in this experiment, $F(2, 62)= 18.59$, $p<.001$, with children's performance in the *post-exposure* question better than they were in the *pre-exposure* question and the *false belief test question*. Furthermore, there was an age by question interaction, $F(4, 62)= 2.61$, $p<.05$, which appears to be located in the 5-year-olds who performed better for the *false belief test question* than the *pre-exposure* question for self. In short, children's understanding of current state of knowing seemed to be better than their understanding of prior state of knowing.

In order to compare children's judgments across person (self and other), a repeated measures analysis of variance was performed for the *discriminate scores* in the false belief task by age and gender. The *discriminate score* was calculated by the same system as those in Experiment 1. That is, any judgment of "know" was given a score of one and any

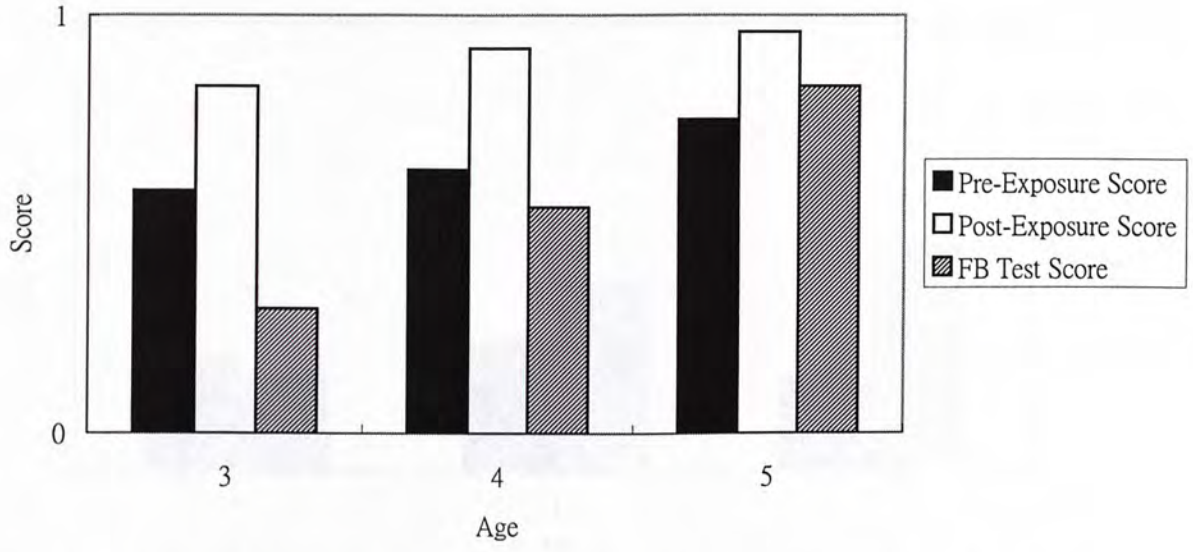

Figure 15. Children' s performance on pre-exposure, post-exposure score (self) and false belief test question [Experiment 2].

judgment of "not know" was given a score of zero, regardless of the question. Next, the *pre-exposure* scores were subtracted from the *post-exposure* scores. Thus, if children answered "know" in the *post-exposure* trial, and "don't know" in the *pre-exposure* trial, they would get a score of 1 – 0 =1 for the *discriminate measure*. Theoretically, scores on this measure could vary from +1 to –1, with a positive score meaning the children said "know" more in the *post-exposure* question, and a negative score indicating that children said "know" more in the *pre-exposure* question. Although the Figure 16 seemed to show that children's performance on *discriminate scores* was better for other than self , none of the age, gender, person effects, nor their interactions, were significant and the means for the 4-and 5-year-olds in both self and other were above the chance level of zero, ps<.05. These findings were different from that of Experiment 1, which main effect of age and the interaction between age and person were found.

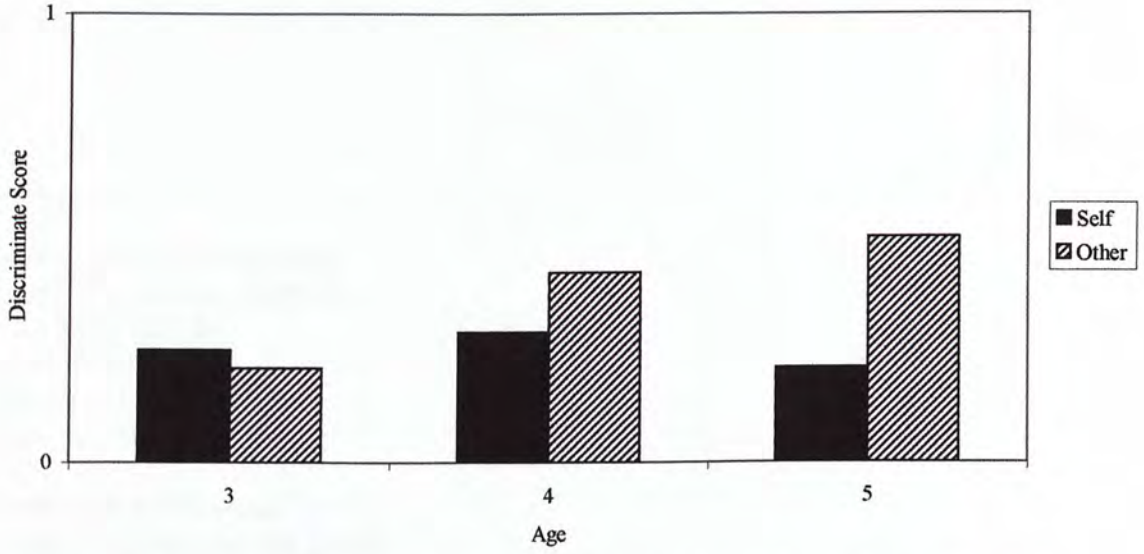

Figure 16. Children' s performance on discriminate scores for self and other in false belief task [Experiment 2].

Overall Performance on Knowing How, Knowing That, and False Belief

As can be seen in Table 8, children's pattern of errors in answering the *pre-* and *post-exposure* questions was similar to that of Experiment 1. Children got the *pre-exposure* questions wrong more often than they erred in the *post-exposure* questions. As in Experiment 1, children's performances on the discriminate measures across the 3 concepts (knowing how, knowing that and false belief) were analyzed together in a repeated measures analysis of variance examining the effects of concept, person, age, and gender. Similar to what was found in Experiment 1, there was a main effect of age, $F(2, 57) = 6.64$, $p<.01$, with children's performance increasing steadily with age, and there was a marginally significant effect of person, $F(1, 57)= 3.62$, $p<.05$, with children's judgments better for self than other. Unlike Experiment 1, a main effect of concept was also found in this experiment, $F(1, 57) = 53.49$, $p<.001$, with children's performance in the knowing-how and knowing-that tasks better than they were in the false belief task. Moreover, there

Table 8
Number of Children Responding in Pre- and Post-Exposure Questions [Experiment 2]

	Self			Other		
	Age			Age		
	3	4	5	3	4	5
Knowing How [Moving Ants]						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	13	17	20	8	13	20
D - D (0-0 = 0)	-	-	1	6	5	3
K - K (1-1 = 0)	11	3	-	9	5	1
D – K (0-1 = -1)	-	-	-	1	1	-
Knowing How [Flashing Eyes]						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	12	16	20	5	14	18
D - D (0-0 = 0)	-	1	-	5	4	3
K - K (1-1 = 0)	12	7	4	10	6	3
D – K (0-1 = -1)	-	-	-	4	-	-
Knowing That [Drawer A]						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	18	19	22	7	13	20
D - D (0-0 = 0)	1	1	-	5	5	3
K - K (1-1 = 0)	4	4	1	11	6	1
D – K (0-1 = -1)	1	-	-	1	-	-
Knowing That [Drawer B]						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	17	18	17	11	13	23
D - D (0-0 = 0)	-	-	-	4	4	1
K - K (1-1 = 0)	7	5	6	8	7	-
D – K (0-1 = -1)	-	-	-	1	-	-
False Belief						
Post – Pre (Discriminate Score)						
K - D (1-0 = 1)	9	7	5	6	12	12
D - D (0-0 = 0)	1	2	1	6	5	10
K - K (1-1 = 0)	11	15	18	11	5	2
D – K (0-1 = -1)	3	-	-	1	2	-

"D" represents "don't know"; "K" represents "know."

were three interactions between the factors were found. The first one is the age by concept interaction, $F(2, 57) = 7.57$, $p<.01$, which as can be seen in Figures 17, the 3-year-olds performed better in the knowing-that task than in the knowing-how task for whereas the 5-year-olds performed better in the knowing-how task than in the knowing-that task. Second is the age by person interaction, $F(2, 57) = 4.12$, $p<.05$, which appears to be located in the 4- and 5-year-olds who performed better for other than self in the false belief task. The third interaction is the one between concept and person, $F(1, 57) = 11.78$, $p< .01$, as can be seen in Figures 17 and 18, the self judgments were better in the knowing-how and knowing-that tasks; however, the 4- and 5-year-olds demonstrated better other judgment in the false belief task while the 3-year-olds did more or less the same in self and other judgment.

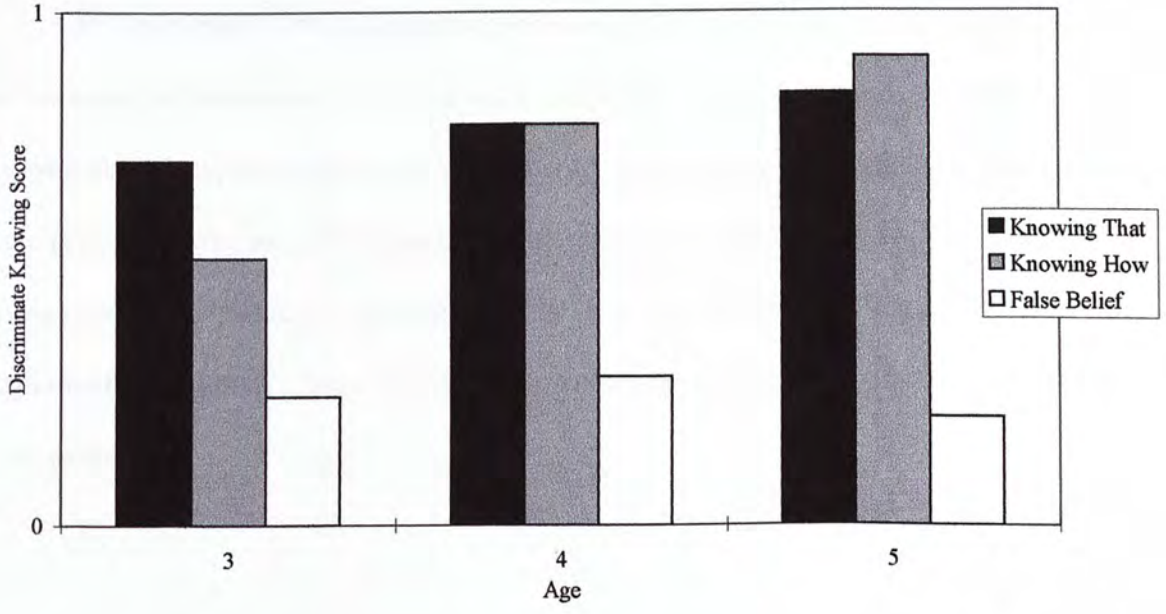

Figure 17. Children's performance on discriminate post versus pre-exposure score for knowing-that, knowing-how and false belief (self) [Experiment 2].

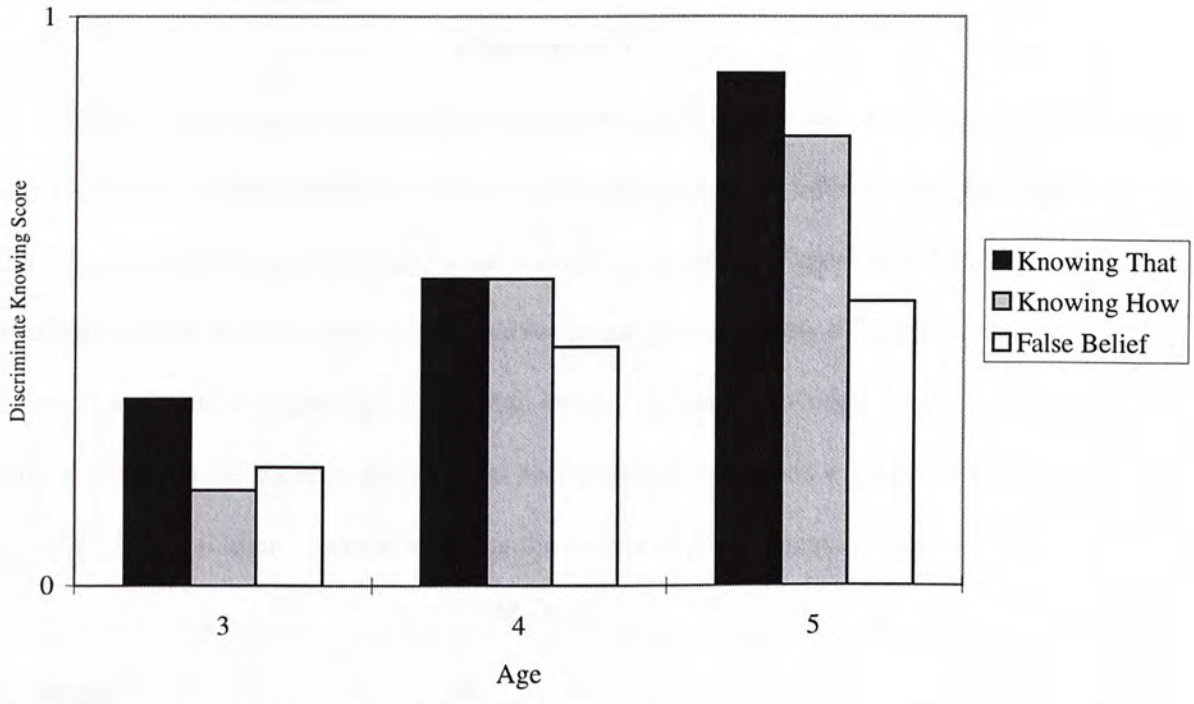

Figure 18. Children's performance on discriminate post versus pre-exposure score for knowing-that, knowing-how and false belief (other 1-other 2) [Experiment 2].

In Experiment 1, the *discriminate measures* demonstrated children's sensitivity to the access to information as a base for knowing judgment. However, this experiment showed that when performance was taken into consideration as well, children's judgments were probably based on performance, rather than the access to information. The children always had had access to the relevant information in both Experiments 1 and 2. In Experiment 3, children's knowing judgments when they were ignorant of such information were examined.

CHAPTER FOUR

Experiment 3

Unlike Experiments 1 and 2, this experiment focused on children's understanding of others' states of knowing, given their own ignorance of certain information. Although children's understanding of the other's knowledge was tested in Experiment 1 and 2, it was always tested after the children themselves knew, and, thus, any difference between self and other could have been attributable to children's own knowledge. Moreover, we intended to determine whether the *pre-* and *post-exposure* questions were asked about the same other figure (Other 1) would replicate the results of Experiment 1 and 2.

Method

Participants

A total of 72 children, half boys and half girls, participated in this experiment. There were 24 at each age group. The 3-year-olds ranged in age from 3-1 to 3-11 (mean age = 3.56, SD = 0.35), the 4-year-olds ranged from 4-0 to 4-11 years (mean age = 4.59, SD = 0.20) and the 5-year-olds ranged from 5-0 to 5-10 (mean age = 5.51, SD= 0.29). None of the participants had taken part in either Experiment 1 or 2. All the participants were attending middle class kindergartens in Shatin, Hong Kong. This experiment was conducted in a quiet room of the kindergarten in which the children were interviewed by a post-graduate student. The children were tested individually for about 10-15 minutes. Parental consent was collected prior to children's participation.

Materials

For the knowing-that task, a chest of drawers (10.5 x 10.5 x 3.5 cm each) was used. The upper drawer contained a candy while the lower drawer contained a toy car. Children

were asked if they knew the contents of the drawers or not. For the first trial, a Doraemon toy acted as the Other 1 (who had access to the contents of the drawer) whereas a Hello Kitty toy acted as the Other 2 (who did not have access to the contents of the drawer). For the second trial, a Forever Friend toy acted as the Other 1 whereas a Miffy toy acted as the Other 2.

For the knowing-how task, there were two sets of materials: (1) a toy with eyes that could flash (2) a set of two magic markers (a green one and a transparent one) and a blank piece of paper. Each set of materials was used for the "trick" that the child was asked if he/ she knew how to do it or not. For the Flashing Eyes task, a Garfield toy acted as the Other 1 (who had access to the trick) whereas a Snoopy toy acted as the Other 2 (who did not have access to the trick). For the Color Changing task, a Tigger toy acted as the Other 1 whereas a Winnie-the-Pooh acted as the Other 2.

For the false belief tasks, there were two sets of materials: (1) a cylinder-shaped package of Smarties with a lid and two pencils inside. (2) a box of colored pencils with bandages inside. A McDull toy acted as the Other 1 (who had access to the contents of the cylinder) whereas an Ah May toy acted as the Other 2 (who did not have access to the contents of the cylinder) in the Smarties task. A Goofey toy acted as the Other 1 whereas a Mickey Mouse toy acted as the Other 2 in the Colored Pencils task.

In addition, there was a set of record sheets (as seen in Appendix C) for marking children's responses in the tasks of "knowing that," "knowing how" and "false belief." Each child participated in all three tasks (knowing-that, knowing-how and false belief) and their order was counterbalanced across children.

Procedure

The structure of the knowing-that and knowing-how tasks was different from those in Experiments 1 and 2. In this experiment, children did not have access to either the contents of the drawers or the tricks. In other words, the role of the children was like that of the Other 2 (the one without access to the relevant information). Moreover, no performances of the other were included. In the knowing-that and knowing-how tasks, both the *pre-* and *post-exposure* questions were asked for the Other 1; however, only the *pre-exposure* questions were asked of the self and the Other 2. Details of the knowing-that and knowing-how tasks are presented below.

(i) Knowing That

In the knowing-that tasks, the child was first shown a set of drawers and the Other 1 was introduced to him/her. The child was then asked, "Does _____ (Other 1) know what's inside?" [Pointing at the drawer] This was the *pre-exposure* question for Other 1. After that, only the Other 1 was shown the contents of the drawer and the child was again asked if the Other 1 knew what was inside the drawer. This was the *post-exposure* question for the Other 1. As in Experiments 1 and 2, the Other 2 then came out, as an ignorant bystander who had never seen inside the drawer. The child was then asked the *pre-exposure* questions for both the Other 2 and the self. Each child received two trials which differed in the order of test questions being asked after the Other 1 was shown the contents of the drawers. One of the trials was in the order of the self *pre-exposure* question followed by the Other 1 *post-exposure* question and the Other 2 *pre-exposure* question; another trial was in the order of the Other 1 *post-exposure* question followed by the *pre-*

exposure question for the Other 2 and the self. The pairings of orders to drawers were counterbalanced across participants.

(ii) Knowing How

The structure of the knowing-how tasks was identical to that of the knowing-that tasks. The knowing-how tasks were tricks that the children were presumed not to know how to do before being taught by the experimenter. The tricks involved changing a green line into a purple line (color-changing task) and making the eyes of a toy flash (flashing-eye task). At the beginning of the task, the child was shown the materials for the trick and he/she was introduced the Other 1. The child was then asked if the Other 1 knew how to perform the trick. This was the *pre-exposure* question for the Other 1. Then, the Other 1 was shown how to perform the trick out of sight of the child. After that, the child was asked about the *post-exposure* question for the Other 1. Thereafter, the Other 2 was brought out as an ignorant bystander and the child was asked about the *pre-exposure* questions for both the Other 2 and the self. As in the knowing-that tasks, the two knowing-how tasks differed in the order of test questions asked and the pairings of orders to tricks were counterbalanced across participants.

(iii) False Belief

Two unexpected contents tasks were used in this experiment. At the beginning of the task, the child was either shown a familiar container of Smarties or a box of colored pencils. After the Other 1 had been introduced to the child, he/she was asked the *pre-exposure* question of the Other 1. Then, the Other 1 was shown the actual contents of the containers. Later, the child was asked about the *post-exposure* question for the Other 1, the

pre-exposure question for the Other 2 as well as the pre-exposure question for the self. Once again, the pairings of orders to tasks were counterbalanced across participants.

Results and Discussion

Pre-Exposure "Knowing How" and "Knowing That"

At the very beginning of each task, unlike Experiment 1 and 2, children were first asked to judge if Other 1, who had not yet been exposed to the relevant information, "knew" how to do the trick or "knew" what was inside the drawers. A correct answer to these Other 1 *pre-exposure* questions, is "don't know," since neither the tricks nor the contents of the drawer were revealed to the puppets. As can be seen in Figure 19, children's judgments for Other 1 in both types of knowing tended to get more conservative, and thus more accurate, with increasing age. Since there were two tasks for each type of knowing, number of "know" judgments could be ranged from 0 to 2. Therefore, the chance level was set as 1. As in Experiment 1, the means for the 4- and 5-year-olds were below what would be expected by chance for both of these tasks, $ps<.05$; however, different from what was found in Experiment 1, the mean for the 3-year-olds was significantly above chance for both of the tasks, $ps<.01$.

In order to investigate whether children have better knowledge judgments of others when they themselves are uninformed of the true state of affairs (Experiment 3) than when they themselves are informed about the true state of affairs (Experiment 1), children's performance on the *pre-exposure* question for others in Experiment 3 was compared with that in Experiment 1. Independent samples t-tests were performed for the number of "know" judgment in the *pre-exposure* questions for others in the knowing-how and knowing-that tasks of Experiment 1 and 3. No significant differences were found between

children's performance on *pre-exposure* questions for others in Experiment 1 and 3. In other words, there was no evidence that children are better at knowledge judgment of others when they are uninformed of the true state of affair.

Apart from the Other 1, children were also asked the *pre-exposure* questions for the Other 2 and the children themselves, who were not exposed to the relevant information. Again, the correct answer to these *pre-exposure* questions, is "don't know," since neither the tricks nor the contents of the drawers were revealed to the children and puppets. As can be seen in Figure 20 and Figure 21, a similar pattern was found for children's performance on the *pre-exposure* questions for the Other 2 and themselves: their performance tended to get more accurate with increasing age. Similar to what was found for the Other 1, the means for 3-year-olds in both tasks were significantly above chance whereas those for the 5-year-olds were significantly below chance, all ps<.05.

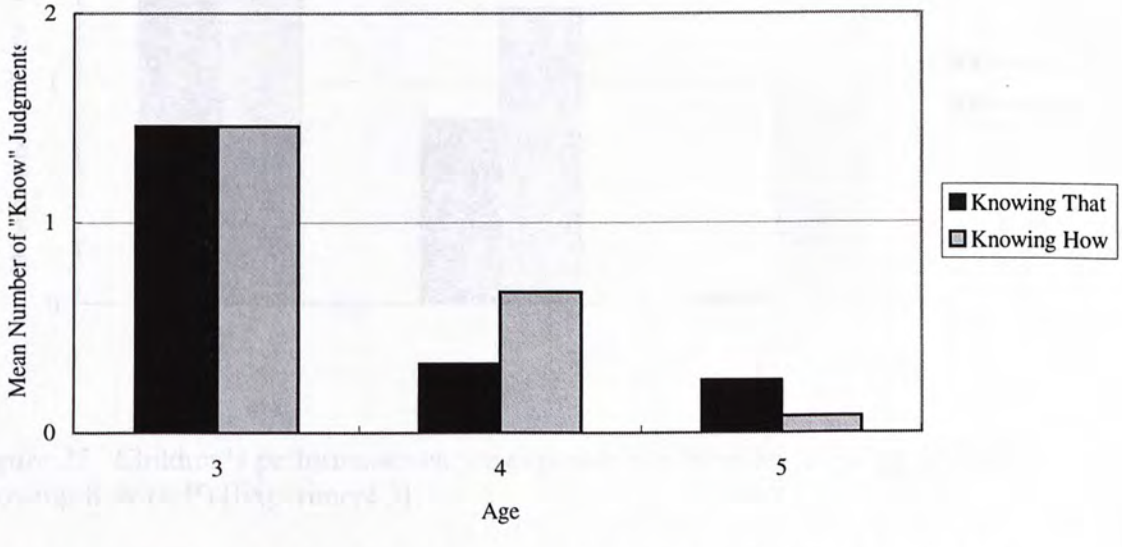

Figure 19. Children's performance on pre-exposure questions for knowing-that and knowing- how (other 1) [Experiment 3].

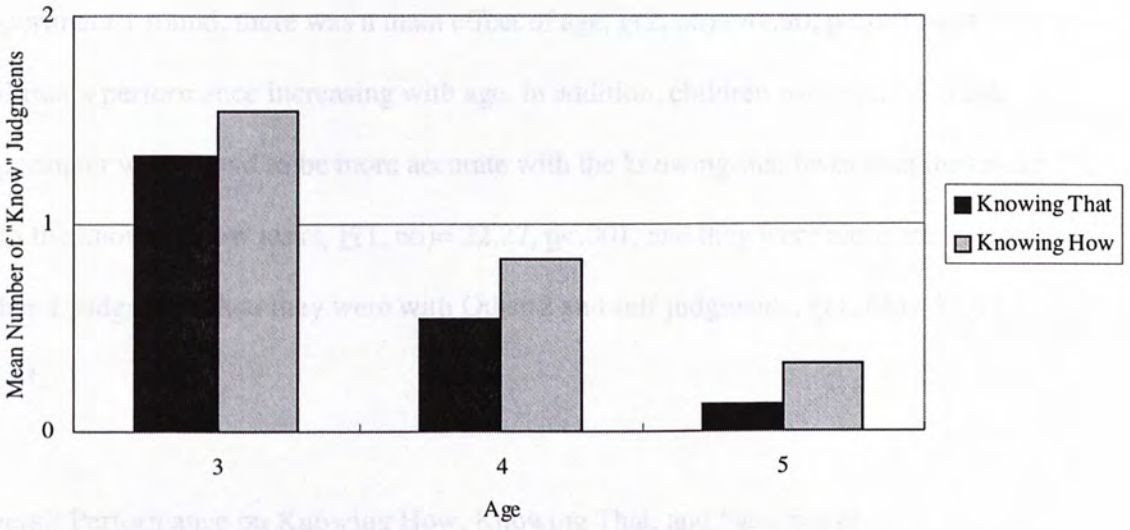

Figure 20. Children's Performance on Pre-Exposure Questions for Knowing-That and Knowing- How (other 2) [Experiment 3].

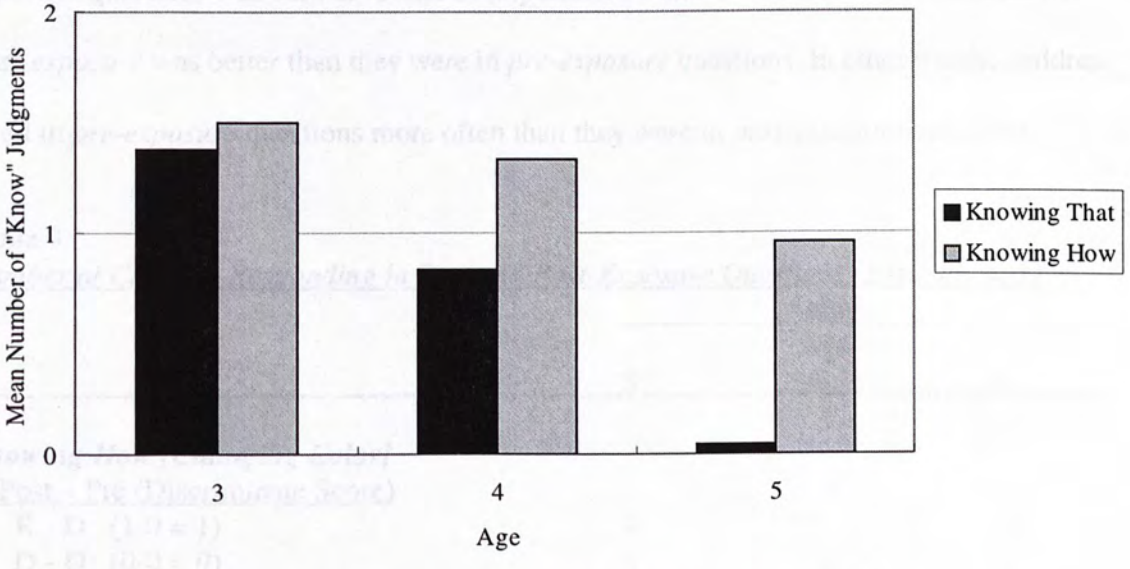

Figure 21. Children's performance on pre-exposure questions for knowing-that and knowing-how (self) [Experiment 3].

In order to compare children's pre-exposure judgments across the two types of knowing (knowing-that and knowing-how) and three kinds of person (Self, Other 1, and Other 2), a repeated measures analysis of variance was performed for the number of

"know" judgments in the knowing-how and knowing-that tasks by age and gender. As Experiment 1 found, there was a main effect of age, $F(2, 66)= 47.90$, $p<.001$, with children's performance increasing with age. In addition, children participated in this experiment were found to be more accurate with the knowing-that tasks than they were with the knowing-how tasks, $F(1, 66)= 22.27$, $p<.001$, and they were more accurate with Other 1 judgments than they were with Other 2 and self judgments, $F(1, 66)= 11.83$, $p<.01$.

Overall Performance on Knowing How, Knowing That, and False belief

As can be seen in Table 9, children's pattern of errors in answering the *pre-* and *post-exposure* questions was similar to that of Experiment 1 and 2. Children's performance in *post-exposure* was better than they were in *pre-exposure* questions. In other words, children erred in *pre-exposure* questions more often than they were in *post-exposure* questions.

Table 9
Number of Children Responding in Pre- and Post-Exposure Questions [Experiment 3]

	Other		
	Age		
	3	4	5
Knowing How [Changing Color]			
Post – Pre (Discriminate Score)			
K - D (1-0 = 1)	4	11	22
D - D (0-0 = 0)	3	2	-
K - K (1-1 = 0)	17	10	2
D – K (0-1 = -1)	-	1	-
Knowing How [Flashing Eyes]			
Post – Pre (Discriminate Score)			
K - D (1-0 = 1)	5	17	20
D - D (0-0 = 0)	1	2	-
K - K (1-1 = 0)	15	5	4
D – K (0-1 = -1)	3	-	-

Table 9 (Con't)
Number of Children Responding in Pre- and Post-Exposure Questions [Experiment 3]

	Other		
	Age		
	3	4	5
Knowing That [Drawer A]			
Post – Pre (Discriminate Score)			
K - D (1-0 = 1)	2	16	21
D - D (0-0 = 0)	2	5	1
K - K (1-1 = 0)	17	3	2
D – K (0-1 = -1)	3	-	-
Knowing That [Drawer B]			
Post – Pre (Discriminate Score)			
K - D (1-0 = 1)	8	16	23
D - D (0-0 = 0)	1	3	1
K - K (1-1 = 0)	15	5	-
D – K (0-1 = -1)	-	-	-
False Belief [Smarties box]			
Post – Pre (Discriminate Score)			
K - D (1-0 = 1)	3	7	11
D - D (0-0 = 0)	4	9	5
K - K (1-1 = 0)	14	6	4
D – K (0-1= -1)	3	2	4
False Belief [Colored pencil box]			
Post – Pre (Discriminate Score)			
K - D (1-0 = 1)	3	8	16
D - D (0-0 = 0)	2	9	2
K - K (1-1 = 0)	16	4	4
D – K (0-1 = -1)	3	3	2

"D" represents "don't know"; "K" represents "know."

In this experiment, since only the Other 1 was exposed to the relevant information, the *discriminate knowing scores* were solely available for the Other 1. The discriminate knowing scores were calculated by giving a score of one to any judgment of "know" and a score of zero to any judgment of "not know," regardless of the question. Next, the *pre-*

exposure scores were subtracted from the *post-exposure* scores. Theoretically, scores on this measure could vary from +2 to –2, with a positive score meaning the children said "know" more after exposure (appropriate), and a negative score indicating that children said "know" more before exposure (inappropriate). With the aim of comparing children's performance across the 3 concepts (knowing how, knowing that, and false belief), the *discriminate knowing scores* for Other 1 were analyzed together in a repeated measures analysis of variance examining the effects of concept, age, and gender. Similar to Experiments 1 and 2, a main effect of age was found, $\underline{F}(2, 66)= 31.47$, $\underline{p}<.001$, with children's performance increasing with age. As can be seen in Figure 22, similar to what was found in Experiment 2, a main effect of concept was found in this experiment, $\underline{F}(1, 66)= 21.38$, $\underline{p}<.001$, with children's performance in the knowing-how and knowing-that tasks better than they were in the false belief task, regardless of children's age.

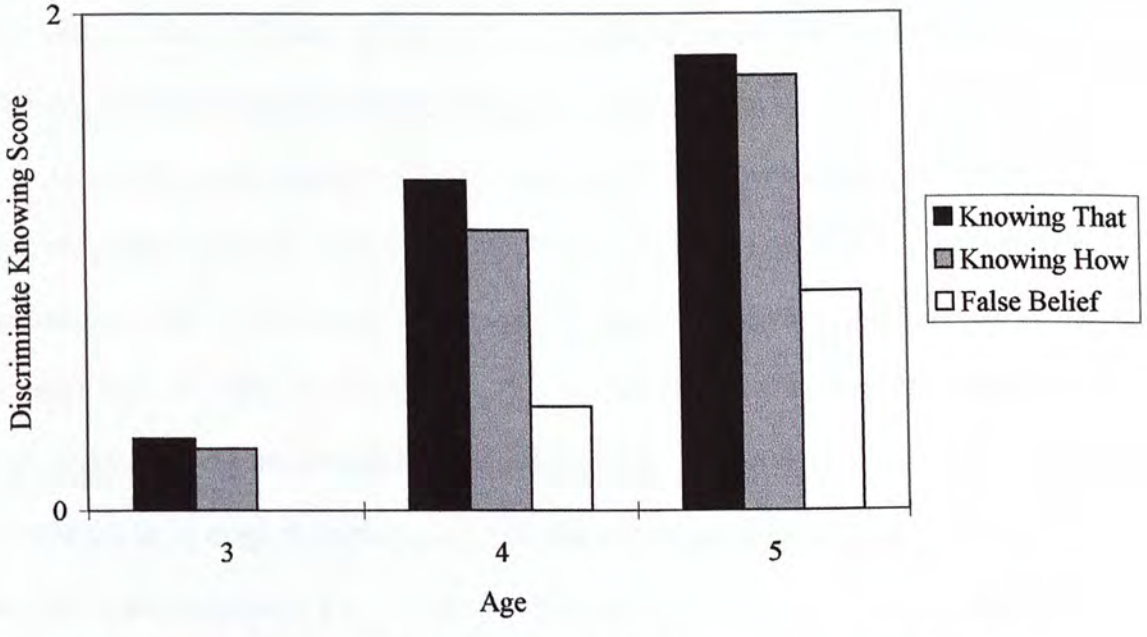

Figure 22. Children's performance on discriminate post versus pre-exposure score for knowing-that, knowing-how and false belief (other1) [Experiment 3].

CHAPTER FIVE

General Discussion

In general, children's understandings of "knowing how" and "knowing that" appears to be better for themselves than they were with others in our study. This finding is importance because it shows a self-other difference for early understandings of knowing. However, the pattern of the self-other difference may be different when the children are ignorant about the relevant information. Despite various variations in tasks, our results do replicate previous findings of children have better understanding of "knowing that" than "knowing how," regardless of self or other. Not surprisingly, the results of the present study reveal a developmental progression in children's understanding of "knowing how" and "knowing that" for both self and other. There is no consistent relation between gender and children's performance across tasks. Furthermore, children's theory of knowing seem to proceed from an early sense of distinctive use of performance outcome to later appreciation of the significance of informational access in the formation of knowledge.

Children's Understanding of Self-Knowledge and Other-Knowledge

One of the main purposes of the present study was to compare children's reports of their own states of knowing with reports of the states of knowing of others. Our findings in Experiments 1 and 2 consistently support our hypothesis that children's self-understanding was better than their other-understanding. This is similar to what Wimmer et al.(1988) found, children were considerably better at judging their own knowledge than they were at assessing the knowledge of another. However, the type of knowledge studied in Wimmer et al.(1988) was declarative knowledge ("knowing that") whereas ours included children's judgments for declarative knowledge ("knowing that") as well as procedural knowledge

("knowing how"). Therefore, the claim that children have better understanding in self-knowledge than other-knowledge could be extended beyond the mental state of "knowing that" and include that of "knowing how."

Inferring from our data, children seem to develop their understanding of their own states of knowing earlier than that of others'. Such a sequence of development consistent with what is predicted by the simulation theory. According to the simulation theory, first-person information about states of knowing has an immediacy and transparency, which are not available in information about others; therefore, children are likely based on their understanding of their own minds to infer about the mental states of others (Harris, 1992). Additional support for the claim that children's understanding of self-knowledge emerges earlier than their understanding of other-knowledge are also available in studies on origins of knowledge.

As mentioned above, children's difficulty in answering questions about others' states of knowing may be result from their incapability to "feel," "sense," or directly "experience" the subjective events which occur in other's mind. However, we should note that subjective inner experiences do not necessarily imply an accuracy advantage to the judgments of self-knowledge as compared with the assessment of others' knowledge (Nelson, Kruglanski, & Jost, 1998). As Miller (2000) claimed, children often have a tendency to over-attribute knowledge to themselves and under-attribute knowledge to another person.

Indeed, children's superiority in self-understanding was only found in the knowing-how and knowing-that tasks, but not in the false belief tasks. This is consistent with what Miller (2000) found in his review: there is little evidence for any primacy of self-

understanding. Even though the studies reviewed by Miller (2000) were most in the standard false belief paradigm whereas the false belief task adopted here were in more alike a knowledge judgments paradigm, both found that children have similar level of understanding for self and other with regard to false belief.

The reason why there was no self-other differences found in the false belief tasks might be due to the relatively late development of children's understanding of false belief when compared to their understanding of "knowing." As previous study found, children understand "knowing" before "thinking" (Fung, 2000), it is possible that children have not yet grasped the concept of false belief at the time being tested. Therefore, their performances in the false belief tasks for self were as poor as they were with others. In other words, if the children are tested at the age of 6 or 7, when they have developed some understandings about false belief, the self-other differences may be observed in the false belief tasks as well.

Apart from the false belief tasks, the superiority of self-understanding may also constrained with children's own knowledge about the relevant information. As Experiment 3 showed, when the children were ignorant about the contents of the drawers or the ways to perform the tricks, their *pre-exposure* knowledge judgments were better for Other 1 than themselves. This might resulted from children's overestimation of their own knowledge: they saw the Other 1 had access to the relevant information, they also assumed themselves have such knowledge and mis-attributed knowledge to themselves in the *pre-exposure* question. Another possibility is that the order of questions for self and the Other 1 influence children's attribution of knowledge. Therefore, the results of Experiment 3 were confounded by both the children's access to the relevant information and the order of the

questions being asked. Further research with better control of these factors are necessary before we could tell if other-understanding is better than self-understanding in certain conditions.

Regardless of whether the supremacy of self-understanding is significant or not, it is clear that empirically there is still much to be investigated about children's understanding of knowing with regard to self and other. Since the other figures were all represented by puppets in our present study, it would be interesting in future research to allow children witness the process in which another real person gain knowledge of "knowing how" and "knowing that." Similar experimental paradigms can be adopted: children's responses to self-knowledge questions are compared with their responses to questions about the states of knowing of others. Since children may find it difficult to imagine that puppets have mental states as human, if real perons are invited to act as the other figures, children may demonstrate better understanding of other's states of knowing as it is more close to what they experience in their everyday life.

Moreover, it would be treasured to contrast children's attribution of knowledge to themselves with their attributions to several other figures who differ in the age dimension (e.g., a same-aged peer, a baby, and a daddy). Not surprisingly, many young children regard their parents as "superman"- parents know everything and capable of doing everything. Thus, when asked to attribute knowledge to Daddy / Mammy, children may consistently attribute "know" to their parents without considering their actual states of knowing. In contrast, baby is always regarded as "naïve" and thus children may simply hold a belief that "babies know nothing." As for the attribution to peers, it may depend on the children's stage of development. If they are still egocentric, then they will attribute

knowledge to their peers according to their own states of knowing; otherwise, they will have objective judgments about others' states of knowing based on performance outcome and access to information. In short, further research on children's attribution of knowledge to others along the age dimension would provide us with another view about children's theories of knowing.

Children's Understandings of "Knowing That" and "Knowing How"

Apart from self-other comparison, our findings also address the concern of the differences in children's ability to make judgments about "knowing how" and "knowing that." Consistent with what previous study found, children were much better at making judgments of "knowing that" than they were at making judgments about "knowing how." Perhaps children have a better understanding of "knowing that" because of the nature of the tasks. It is relatively easy to tell the contents of drawers when compared with performing some actions in the knowing-how tasks. However, our procedures focus on children's abilities to judge the states of knowing at different critical phases of the tasks, rather than their abilities to become knowledgeable. In fact, we tried our best to make our knowing-how tasks comparable to the knowing-that tasks. Instead of using complex knowing-how tasks, we adopted simple knowing-how tasks, which could be acquired quickly on the basis of a single demonstration. In this way, the knowing-how tasks are parallel to the knowing-that tasks in the sense that children learned them in a single exposure.

Indeed, even though the structures of the knowing-that and knowing-how tasks adopted here were designed to be similar as that of Fung (2000), there are differences between each experiment and Fung's (2000) study. First of all, the knowing tasks adopted

in Experiment 1 were actually a simplification. Instead of studying children's understanding of knowing in terms of several aspects (e.g., source knowledge, access to information etc.) simultaneously, Experiment 1 was solely designed to examine children's understanding of knowing in terms of informational access with the addition of the other-part. With such a simple design, children showed better performances on the knowing-that tasks then in the knowing-how tasks. In Experiment 2, with the addition of others' performance outcomes, children still showed better understanding of "knowing that" than of "knowing how." At last, children were kept ignorant to the contents of the drawers and the ways to perform the tricks in Experiment 3, but still, children demonstrated better in their understanding of "knowing that." In short, despite differences in the design of the series of studies and regardless for self or other, the primacy of children's understanding of "knowing that" remains to be significant.

(i) Pre-Exposure "Knowing How" and "Knowing That"

In response to the *pre-exposure* knowledge question, no matter whether it refers to the one in the knowing-that, knowing-how or the false belief task, 3-year-olds had a bias towards claiming that they "know." For the 4- and 5-year-olds, they were able to indicate that they "don't know" before having had access to the relevant information. These results are consistent with that of Fung (2000). Although the response bias among the 3-year-olds demonstrates their misconception of knowing and a lack of representational theory of mind, it is suggested that such a bias is very useful to children's acquisition (Bjorklund & Green, 1992). Being optimistic about one's own competence, children will explore the world around them with confidence. Also, their interest in learning tend not to be hindered by the realistic worries of inability. As expected, children will recognize their "naïve" attitude as

they grow older, which in return weakens their response bias. However, the rate of disappearance could differ among different mental states.

In the present study, children's understanding of "knowing that" appears to emerge earlier than that of "knowing how." For example, as can be seen in Figure 21, 3-year-old children's performance on *pre-exposure* questions for self were found to be more or less the same in the knowing-that and knowing-how tasks. Nevertheless, by the age of 4, children's response bias of "know" judgment decreased from above chance level (mean number of "know" judgments = 1) to below chance for the concept of "knowing that" but not for "knowing how." Among the 5-year-olds, their response bias seems to completely disappear in the knowing-that task while it remains in the knowing-how task.

(ii) Awareness of a Transition from "Not Knowing" to "Knowing"

The tricks used in the knowing-how tasks were assumed to be novel to the children. Therefore, the children should have experienced a major change with their procedural knowledge, that is, the change from not knowing to knowing. Similarly, children could not guess the contents of the drawers without looking in them in the knowing-that tasks; therefore, they also experienced a change in factual knowledge when the experimenter showed them the contents. In short, an awareness of the transition from not knowing to knowing is a prerequisite for understanding the mental states of "knowing how" and "knowing that."

Indeed, the *pre-* and *post-exposure knowledge questions* of the present study captured children's awareness of the mental states of "not knowing" and "knowing," respectively. As mentioned before, the 3-year-olds consistently made errors in their responses to the *pre-exposure knowledge questions*; however, they were able to answer the

post-exposure knowledge questions correctly across tasks. This indicates that although the 3-year-olds do not have an awareness of their "ignorant" mental state, almost all of them were able to recognize that they were in the state of "knowing" after being exposed to relevant information. For the 4- and 5-year-olds, since they already understood their ignorance in the pre-exposure phase, they appreciated the transition from not knowing to knowing more than their 3-year-olds counterparts. This result is consistent with what Taylor, Esbensen, and Bennett (1994) found. They found that young children are surprising unaware of changes in their knowledge. It was suggested that children's inability to appreciate the transition in states of knowing may be due to a general inability to store or retrieve temporal events in memory (Esbensen, Taylor, & Stoess, 1997) or a lack of an understanding in representational change (Gopnik & Astington, 1988).

Apart from testing children's awareness of a transition from not knowing to knowing, the *pre-* and *post-exposure knowledge questions* were also designed to examine children's understanding that "knowing how" and "knowing that" are indeed products of a person's exposure to relevant information.

(iii) The Role of Informational Access in Knowledge Formation

Once children have an awareness of a transition from not knowing to knowing, they should appreciate the role of informational access in the formation of "knowing how" and "knowing that." Children need to grasp the causal relationship between exposure to relevant information and the resulting epistemic effect (e.g., knowing the contents of the drawers or knowing how to perform tricks). Such understanding could be evident when children correctly judge another person's states of knowing when the other's knowledge can only be inferred from the person's exposure to relevant information (Experiments 1 and

3). After children have understood the critical role of information access, they should be capable of judging whether another person "knows" or "does not know" based on whether the person had or did not have access to relevant information.

The *discriminate knowing measures* constructed from children's responses to the *pre-* and *post-exposure questions* in the knowing-how and knowing-that tasks revealed children's understanding of the significance of informational access in the formation of knowledge. On the one hand, if children erred in that they claimed that another person "knew" before informational access was provided, they had probably not yet regarded informational access as an essential component for knowing. On the other hand, if children erred in that they claimed another person "didn't know" after he/she had access to the relevant information, they seemed to be neglect the fact that informational access leads to knowledge. Regardless of the type of error made, the *discriminate knowing measure* is a sensitive indicator of children's understanding of the importance of informational access.

As can be seen in Figures 4 and 9, the means for the *discriminate knowing measures* are all above zero, indicating that children in each age group were more likely to attribute knowledge, for both "knowing that" and "knowing how," to Other 1 (who had informational access) than Other 2 (who did not have informational access). This shows that children have at least a basic appreciation of the role of informational access in the formation of knowledge. Moreover, children's performance appears to be more accurate with increasing age and better for "knowing that" in comparison to "knowing how." This indicates that children's understanding of the importance of informational access gradually develops across preschool ages and emerges earlier in the concept of "knowing that" than in "knowing how."

However, in Experiments 1 and 2, children's error in attributing knowledge to the Other 2 (who did not have informational access) in the *pre-exposure knowledge question* and their correct attribution of knowledge to Other 1 (who had informational access) in the *post-exposure knowledge question* were confounded by egocentric knowledge attributions. Since in both Experiments 1 and 2, the self-part was prior to the other-part, children were always knowledgeable about the contents of the drawers (or how to perform the tricks) when the *pre-* and *post-exposure knowledge* questions for other were asked. Children might simply attribute knowledge to the Other 2 (no access) and Other 1 (with access) according to their own states of knowing. Thus, in Experiment 3, children's access was kept different from that in Experiments 1 and 2, they were ignorant of either the contents of the drawers or they ways in which the tricks were done. Also, children's knowledge judgments for others were tested before that for themselves. To examine whether these manipulations would affect children's attribution of knowledge to others, which in return might have an effect on their performance on the *discriminate knowing measures*.

According to Wimmer et al. (1988), judging others' knowledge without knowing the fact themselves might pose some difficulties for children. Thus, it was possible that not knowing what the other knew might have misled children to deny that the other knew. However, as can be seen in Figure 22, children's performance on the *discriminate knowing measures* in Experiment 3 was similar to that found in Experiments 1 and 2. Therefore, our conclusions remain. In this regard, our data demonstrated children's concern of the importance of access to information in their knowledge attributions.

In fact, understanding that access to information is necessary for knowing, children would be able to differentiate "to know" from " to guess" on this basis. According to

Johnson and Wellman (1980), 4-year-old children can semantically differentiate between "know" and "guess" on the basis of whether a person has informational access. However, the children were in situations where the performance outcome was not salient. Beal and Flavell (1983) found that, when children are in the situation where the performance outcome is salient, they will focus on whether a person's answer is correct or incorrect, rather than whether the person has access to information. Our findings support the later claim.

(iv) The Role of Performance Outcome in Knowledge Attribution

As can be seen in Figures 10 and 11, whenever successful performances of the puppets were shown, almost all of the children, regardless of their age, attributed knowledge to the puppets no matter whether they had or did not have access to information beforehand. This indicates that according to children's theory of knowing, whether a person can act successfully or answer correctly is the best indicator of whether the person possesses the corresponding knowledge. In other words, young children tend to overlook the importance of access to information when they attribute knowledge to others; instead, they focus on other's performances outcome. As a matter of fact, the association of knowledge with successful performance is so strong, an outward demonstration of success is almost equivalent to being knowledgeable.

Nevertheless, when the performance outcome was an unsuccessful one instead, no universal pattern of knowledge attribution was found; that is, not every child claimed the puppets who demonstrated a failed performance "did not know." (as can be seen in Figures 12 and 13). Being shown a failed performance, 3-year-old children just attributed knowledge to <u>others</u> randomly in both knowing-how and knowing-that tasks whereas the

4- and 5-year-olds were more likely to attribute "don't know" to others. Consistently, children's understanding of "knowing that" appears to emerge earlier than that of "knowing how." As can be seen in Figures 12 and 13, the 4- and 5-year-olds were less likely to attribute "know" to the failure of others in the knowing-that task than they were in the knowing-how task.

It is interesting to note that, the 4- and 5-year-olds had a higher tendency in attributing "knowing how" to the Other 1 (who had prior informational access), even if it demonstrated unsuccessful performance (as can be seen in Figure 12). Although it seems to be "wrong" to attribute knowledge to the Other 1 after the failed performance was shown, such an error might be justified if the children attributed knowledge to the Other 1 based on its prior access to relevant information. It seems that the 4- and 5-year-olds might have considered both performance outcome and access to information as bases for knowledge attribution. Therefore, their errors in the knowledge attribution could be interpreted as a transitional stage in their understanding of knowing.

According to Montgomery (1992), children appear to have a "theory of knowing," which is a coherent set of principles. These principles seem to have a hierarchical order in structure, that is, the components within the construct are weighted for salience or importance. For instance, outward demonstration of successfulness (or correctness) appears to be the most salient and important component of knowing for the 3-year-olds. Even though the 3-year-olds recognize that informational access is an important component of knowing, demonstration of successfulness in performing a trick (or correctness in telling the contents of a drawer), in the absence of prior access to the relevant information, is enough for the children to attribute knowledge. As children's

understanding of knowledge develop, however, the hierarchical order of these components changes; for example, the children may view informational access as equally important as the outward demonstration of successfulness. With development, children gradually regard knowledge in terms of a number of preconditions.

In the present study, since there were only two defining components of knowledge (access to information and performance outcome), children's task of attributing knowledge became rather straightforward. However, it was suggested that error comes with simplification (Montgomery, 1992) because placing too much importance on a component results in children's overestimate of knowledge in others. Such a claim may be useful in accounting for children's attribution errors to those who have prior informational access but demonstrated unsuccessful performance and those who have no prior informational access but demonstrated successful performance.

Children's Understandings of "Knowing That" and "False Belief"

In the present study, the false belief tasks functioned as an alternative task to examine children's understanding of "knowing that." Indeed, the structure of the knowing-that tasks and the false belief tasks was very similar. In both tasks, children were asked if they knew the contents of a closed container in the *pre-* and *post-exposure questions*. The difference between the knowing-that and false belief tasks was that children should have no idea about the contents of the drawers in the knowing-that task; however, they might have a false belief about the contents in the unexpected contents task.

In order to compare children's performance across the knowing-that and false belief tasks, the *discriminate measures* seemed to be the best choice as they captured the most comparable aspects of the tasks. Empirically, the differences between children's

knowledge judgments in the knowing-that task and that in the false belief tasks were consistent across age and experiments. All of the three experiments found that children's performances on the *discriminate measures*, regardless for self or other, were better in the knowing-that tasks than they were in the false belief tasks (as can be seen in Figures 6, 17, 18 and 22).

Since the present study was aimed at contrasting children's understanding of "knowing that" with their understanding of "knowing how," regarding the false belief task as a knowing-that task, it was important to compare children's performance on the knowing-how tasks with that in the false belief task. In contrast to the findings that children were better at their understanding of "knowing that" in comparison to "knowing how," (as can be seen in Figure 6, 17, 18 and 22) children's performances on the *discriminate measures* were better in the knowing-how tasks than they were in the false belief tasks. This shows that although the false belief task could be regarded as a knowing-that task, the two tasks indeed are subtlely different from one another.

Actually, the false belief task adopted in Experiment 2 was a "real" test of false belief, since children were asked about their previous knowledge of the contents. In order to answer this *false belief test question* correctly, children were required to suppress their current knowledge state and make judgments about their earlier lack of knowledge and false belief. Comparing across the *pre-* and *post-exposure* questions, which revealed children's understanding of current states of knowing, it was assumed that children would find it more difficult to answer the *false belief test question*. This was anticipated because in order to answer the *false belief test question* correctly, children are required to keep two different knowledge states in mind and make judgments about states that are different from

their current states of knowing. Yet, the 3-year-olds' performances on the *false belief test question* were more or less the same as they were in the *discriminate measure* (as can be seen in Figure 15) whereas the 5-year-olds' performance on the *false belief test question* was significantly better than it was on the *discriminate measure*. This implied that children's understanding of their prior states of knowing (false belief) develop between the age of 3 and 4.

In fact, false belief task is often regarded as a standard test for children's understanding of theory of mind with reference to "thinking." Thus, it is useful to treat it as a reference point for comparison. Among comparisons, it is consistently found that children's performance on the knowing tasks, regardless of whether knowing-how or knowing-that task, are better than they were in the false belief tasks. This implies that children understand the mental states of "knowing" before that of "thinking." This arises a question of why children understand the mental states of thinking later than that of knowing. Thus, it would be interesting to explore the reasons for such a developmental sequence of understanding in future studies.

In conclusion, the present study found that children's understanding of "knowing that" is consistently superior to their understanding of "knowing how, regardless of variations between the tasks. Children appear to be better with self-understanding than they were in other-understanding. Also, children seem to regard performance outcome as a more important indicator of knowing when compared with the access to relevant information.

References

Astington, J. W. (1993). The child's discovery of the mind. Cambridge, MA, USA: Harvard University Press.

Astington, J. W., Harris, P. L., & Olson, D. R. (1988). Developing theories of mind. Cambridge: Cambridge University Press.

Bartsch, K., & Estes, D. (1996). Individual differences in children's developing theory of mind and implications for metacognition. Learning and Individual Differences, 8 (4), 281-304.

Bartsch, K., & Wellman, H. M. (1995). Children talk about the mind. Oxford, England: Oxford University Press.

Beal, C. R., & Flavell, J. H. (1983). Young speakers' evaluations of their listener's comprehension in a referential communication task. Child Development, 54, 148-153.

Bjorklund, D. F., & Green, B. L. (1992). The adaptive nature of cognitive immaturity. American Psychologist, 47, 46-54.

Browne, D. (1997). Putting Knowledge to work. Behavioral and Brain Sciences, 20, 353-354.

Corkill, A. J. (1996). Individual differences in metacognition. Learning and Individual Differences, 8(4), 275-279.

Dunn, J. (1994). Changing minds and changing relationships. In C. Lewis & P. Mitchell (Eds.), Children's early understanding of mind: Origins and development (pp. 297-310). Hillsdale, NJ: Erlbaum.

Esbensen, B. M., Taylor, M., & Stoess, C. (1997). Children's behavioral understanding of knowledge acquisition. Cognitive Development, 12, 53-84.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. American Psychologist, 34(10), 906-911.

Flavell, J. H. (1985). Cognitive development. Englewood Cliffs, NJ: Prentice Hall.

Flavell, J. H., Miller, P. H., & Miller, S.A. (1993). Cognitive Development (3 rd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Fung, Y. F. (2000). Children's understanding of "knowing how," "knowing that" and "thinking." Unpublished bachelor's thesis, Chinese University of Hong Kong.

Goldman, A. I. (1993). The psychology of folk psychology. Behavioral and Brain Sciences, 16, 15-28.

Gopnik, A., & Astington, J. (1988). Children's understanding of representational change and its relation to the understanding of false-belief and the appearance-reality distinction. Child Development, 59, 26-37.

Gopnik, A., & Graf, P. (1988). Knowing how you knows: Young children's ability to identify and remember the sources of their beliefs. Child Development, 59, 1366-1371.

Gopnik, A., & Wellman, H. M. (1994). The theory theory. In L. Hirschfield & S. Gelman (Eds.), Domain specificity in cognition and culture (pp. 257-293). New York: Cambridge University Press.

Graf, P., & Schacter, D. L. (1985). Implicit and explicit memory for new associations in normal and amnesic subjects. Journal of Experimental Psychology: Learning, Memory, and Cognition, 11, 501-518.

Greco, J. (1999). What is epistemology? In J. Greco & E. Sosa (Eds.), The Blackwell Guide to Epistemology (pp. 1-33). Malden, Mass: Blackwell Publishers.

Harris, P. L. (1992). From simulation to folk psychology: The case for development. Mind and Language, 7(1/2), 120-144.

Johnson, C. N. (1988). Theory of mind and the structure of conscious experience. In J. W. Astingon, P. L. Harris, & D. R. Olson. (Eds.), Developing theories of mind (pp. 47-63). Cambridge: Cambridge University Press.

Johnson, C. N., & Wellman, H. M. (1980). Children's developing understanding of mental verbs: Remember, know, and guess. Child Development, 51, 1095-1102.

Johnson, C. N., & Wellman, H.M. (1982). Children's developing conceptions of the mind and brain. Child Development, 53, 222-234.

Johnson, M. K., & Hasher, L. (1987). Human learning and memory. Annual Review of Psychology, 38, 631-668.

Leekam, S. (1993). Children's understanding of mind. In M. Bennett (Ed.), The child as psychologist (pp. 26-61). New York: Harvester Wheatsheaf.

Lorsbach, T. C., Sodoro, J., & Brown, J. S. (1992). The dissociation of repetition priming and recognition memory in language/ learning-disabled children. Journal of Experimental Child Psychology, 54, 121-146.

Miller, S. A. (2000). Children's understanding of preexisting differences in knowledge and belief. Developmental Review, 20, 227-282.

Montgomery, D. E. (1992). Young children's theory of knowing: The development of a folk epistemology. Developmental Review, 12, 410-430.

Moore, C., Furrow, D., Chasson, L., & Patriquin, M. (1994). Developmental relationships between production and comprehension of mental terms. First Language, 14, 1-17.

Nelson, T. O., Kruglanski, A. W., & Jost, J. T. (1998). Knowing thyself and others: Progress in metacognitive social psychology. In V. Y. Yzerbyt, G. Lories & B. Dardenne (Eds). Metacognition : cognitive and social (pp.69-89). London; Thousand Oaks: Sage Publications.

Nickerson, R. S., Baddeley, A., & Freeman, B. (1987). Are people's estimates of what other people know influenced by what they themselves know? Acta Psychologica, 64, 245-259.

Pea, R. D. (1982). Origins of verbal logic: Spontaneous denials by two- and three-year-olds. Journal of Child Language, 9, 597-626.

Perner, J. (1991). Understanding the representational mind. Cambridge, MA: MIT Press.

Ruffman, T. K., & Olson, D. R. (1989). Children's ascriptions of knoweldge to others. Developmental Psychology, 25(4), 601-606.

Tardif, T., & Wellman, H. M. (2000). Acquisition of mental state language in Mandarin- and Cantonese-speaking children. Developmental Psychology, 36(1), 25-43.

Taylor, M. (1996). A theory of mind perspective on social cognitive development. In R. Gelman & K. F. Au (Eds.), Perspectual and cognitive development. Handbook of perception and cognition (pp. 283-329). San Diego, CA, USA: Academic Press, Inc.

Taylor, M., Cartwright, B. S., & Bowden, T. (1991). Perspective taking and theory of mind: Do children predict interpretive diversity as a function of differences in observer's knowledge? Child Development, 62, 1334-1351.

Taylor, M., Esbensen, B. M., & Bennett, R. T. (1994). Children's understanding of knowledge acquisition: The tendency for children to report that they have always knows what they have just learned. Child Development, 65, 1581-1604.

Tulving, E. (1972). Episodic and semantic memory. In E. Tulving & W. Donaldson (Eds.), Organization of memory (pp. 381-403). New York: Academic Press.

Tulving, E. (1985). How many memory systems are there? American Psychologist, 40, 385-398.

Wellman, H. M. (1985). The origins of metacognition. In D. L. Forrest-Pressley, G. E. McKinnon, & T. G. Waller (Eds.), Cognition, metacognition and performance (pp. 1-31). New York: Academic Press.

Wellman, H. M. (1990). The child's theory of mind. Cambridge: MIT Press, A Bradford Book.

Wellman, H. M., & Johnson, C. N. (1979). Understanding mental processes: A developmental study of "remember" and "forget." Child Development, 50, 79-88.

Wimmer, H., Hogrefe, G. J., & Perner, J. (1988). Children's understanding of informational access as a source of knowledge. Child Development, 59, 386-396.

Wimmer, H., Hogrefe, G., & Sodian, B. (1988). A second stage in children's conception of mental life: Understanding informational accesses as origins of knowledge and belief. In J. W. Astington, P. L. Harris, & D. R. Olson (Eds), Developing theories of mind (pp. 173-192). New York: Cambridge University Press.

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"Knowing How" --------- Task ( ) 變色筆 (Self) A winnie the pooh & 跳跳虎

****

SETUP: 1) 取出一張紙放在桌上 2) 將兩枝脫蓋顏色筆放在紙與實驗員之間, 但要遠離小朋友 3) 在紙上畫一條橫向小朋友的綠線 4) 把綠色筆放回原位 5) 用手指指著該線

變色筆----Trial 1

E: 呢度有條線, 佢係咩野色架 (指著線)? 綠色...係啦! 你識唔識得點樣將呢條綠色既線 (指著線)變成紫色? **(假如小朋友不說線是綠色, prompt "係, 不過佢似唔似綠色呀?")**

識 ☐ 咁你玩一次俾我睇!

OK ☐→ 好叻喎! → **CUTTING STRAW TASK A**

唔 OK ☐→ 其實係咁樣既... Trial 1: **SHOW!!** → test 1

SHOW PROCEDURE: 1) 確保實驗員的手不會阻礙小朋友視線 2) 用綠色筆畫另一條線 3) 拿起白色筆, 明顯地展示給小朋友看到白色筆已被拿起 4) 用白色筆在綠線上油, 把它變成紫色

唔識 ☐ 其實係咁樣既... Trial 1: **SHOW!!** → test 1

SHOW PROCEDURE: 1) 確保實驗員的手不會阻礙小朋友視線 2) 用綠色筆畫另一條線 3) 拿起白色筆, 明顯地展示給小朋友看到白色筆已被拿起 4) 用白色筆在綠線上油, 把它變成紫色

變色筆 ---- Trial 2

E: 咁而家你識唔識得點樣將條綠色既線變成紫色?

☐ **識**, 咁你玩一次俾我睇!

OK ☐ 好叻喎! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣將條綠色既線變成紫色?

有 ☐ 沒有 ☐ → **OTHER 1**

唔 OK ☐ 咁而家你識唔識得點樣將條綠色既線變成紫色?

識 ☐ 好叻喎! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣將條綠色既線變成紫色?

有 ☐ 沒有 ☐ → **OTHER 1**

唔識 ☐ 其實係咁樣既... Trial 2: **SHOW!!** → test 2

SHOW PROCEDURE: 1) 確保實驗員的手不會阻礙小朋友視線 2) 用綠色筆畫另一條線 3) 拿起白色筆, 明顯地展示給小朋友看到白色筆已被拿起 4) 用白色筆在綠線上油, 把它變成紫色

☐ **唔識**, 其實係咁樣既... Trial 2: **SHOW!!** → test 2

SHOW PROCEDURE: 1) 確保實驗員的手不會阻礙小朋友視線 2) 用綠色筆畫另一條線 3) 拿起白色筆, 明顯地展示給小朋友看到白色筆已被拿起 4) 用白色筆在綠線上油, 把它變成紫色

變色筆 ---- Trial 3

E: 咁而家你識唔識得點樣將條綠色既線變成紫色? (把綠色筆推向小朋友)

☐ **識**, 咁你玩一次俾我睇!

OK ☐ 好叻喎! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣將條綠色既線變成紫色?

有 ☐ 沒有 ☐ → **OTHER 1**

唔 OK ☐ 咁而家你識唔識得點樣將條綠色既線變成紫色?

識 ☐ 好叻喎! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣將條綠色既線變成紫色?

有 ☐ 沒有 ☐ →**OTHER 1**

唔識 ☐ → **OTHER**

☐ **唔識** → **OTHER**

"Knowing How" ——— Task ( ) 變色筆 (Other 1 & 2) [AO-NO] A

SETUP: 在紙上畫一條橫向 Winnie the Pooh 的綠線

E: Winnie the Pooh 你識唔識得點樣將呢條綠色既線變成紫色? (面向 Winnie the Pooh 說)

W: 唔識呀, 我唔識得點樣將呢條綠色既線變成紫色

E: Winnie the Pooh, 其實係咁樣既..... (向 Winnie the Pooh 示範)

SHOW PROCEDURE: 1) 確保實驗員的手不會阻礙 Winnie the Pooh 視線
2) 用綠色筆畫另一條線 3) 拿起白色筆, 明顯地展示給 Winnie the Pooh 看到白色筆已被拿起 4) 用白色筆在綠線上油, 把它變成紫色

("跳跳虎" 出現 .....)

E: 依..."跳跳虎" 黎左喎..... 佢從來都冇睇過呢個魔術, 頭先我教 Winnie the Pooh 點樣玩既時候, 佢又唔係度喎, **咁"跳跳虎" 識唔識得點樣將條綠色既線變成紫色?**

識 ☐ 咁 "跳跳虎" 係點學識架? _____
唔識 ☐ 點解 "跳跳虎" 唔識既? _____

E: **咁 Winnie the Pooh 識唔識得點樣將條綠色既線變成紫色?**

識 ☐ 咁 Winnie the Pooh 係點學識架? _____
唔識 ☐ 點解 Winnie the Pooh 唔識既? _____

E: **咁邊個之前睇過呢個魔術呀? Winnie the Pooh 定係"跳跳虎"?**

☐ Winnie the Pooh ☐ "跳跳虎" → NEXT TASK

"Knowing That" ---------- Drawer A (Self) A

****

SETUP: 1) 取出 Hello Kitty, 放 叮噹 在一旁 2) 將 Hello Kitty 放在桌上 3) 取出櫃桶座, 用手指按著上下櫃桶門, 把整座向前傾搖, 使入面的物件向前移櫃桶的前端, 但櫃桶又不會被打開. 2) 將櫃桶座放在桌上, 實驗員的旁邊, 面向著小朋友 3) 糖放第一格櫃桶

Drawer —See (1)

E: 呢度有幾格櫃桶, 你知唔知道呢格櫃桶入面有 d 咩野？(指著第一格櫃桶, 手指仍然按著櫃桶, 以免小朋友打開偷看!)

知 ☐ 係咩野黎架？_____

☐(✓) → **DRAWER B**

☐(x) 其實入面唔係 xx 黎過喎! 其實入面係....

Trial 1: **SHOW!!!** → test 1

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

唔知 ☐ 其實入面係....

Trial 1: **SHOW!!!** → test 1

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

Drawer —See (2)

E: 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ · 係咩野黎架？_____

☐(✓) 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐ → **OTHER 1**

☐(x) 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐ → **OTHER 1**

唔知 ☐ 其實入面係.... Trial 2: **SHOW!!!** → test 2

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

唔知 ☐ 其實入面係.... Trial 2: **SHOW!!!** → test 2

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

Drawer —See (3)

E: 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ · 係咩野黎架？_____

☐(✓) 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐ → **OTHER 1**

☐(x) 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐ → **OTHER 1**

唔知 ☐ → **OTHER 1**

唔知 ☐ → **OTHER 1**

"KNOWING THAT" ——— Drawer A (Other 1 & 2) A

E: Hello Kitty 你知唔知道呢格櫃桶入面有 d 咩野？(指著第一格櫃桶)

W: 唔知呀，我唔知道呢格櫃桶入面有 d 咩野

E: Hello Kitty，其實入面係… (向 Hello Kitty 示範)

SHOW (拉出櫃桶，把它傾斜)

("叮噹" 出現 ……)

E: 依…"叮噹" 黎左喎…… **佢從來都冇睇過呢格櫃桶入面有 d 咩野，**頭先我俾 Hello Kitty 睇既時候，佢又唔係度喎，**咁叮噹知唔知道呢格櫃桶入面有 d 咩野？**

知 ☐ 咁 叮噹 係點知架? _____

唔知 ☐ 點解 叮噹 唔知既? _____

E: **咁 Hello Kitty 知唔知道呢格櫃桶入面有 d 咩野？**(指著第一格櫃桶)

知 ☐ 咁 Hello Kitty 係點知架? _____

唔知 ☐ 點解 Hello Kitty 唔知既? _____

E: **咁邊個之前睇過呢格櫃桶入面有 d 咩野? Hello Kitty 定係"叮噹"?**

☐ Hello Kitty ☐ "叮噹" → NEXT TASK

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"False Belief" (M & M Task) **A**

****

SETUP: 1) 取出 麥兜, 放阿 may 在一旁 2) 將麥兜放在桌上, 小朋友的旁邊, 面向著實驗員 3) 將 Smarties 筒放在桌上, 實驗員的旁邊 4)切勿讓 Smarties 筒內的鉛筆發出聲響

False Belief ---- Trial 1

E: 呢度有個筒, 你知唔知道呢個筒入面有 d 咩野？

知 ☐ 係咩野黎架？_____

(GET the child to agree with you that "入面有朱古力", 若小朋友說其他東西
first prompt, "個筒似唔似裝住 d 朱古力?"
second prompt, "呢個係咩野筒黎架? 入面應該裝住 d 咩野?"
third prompt, "個筒入面應該有朱古力, 定係書?")

E: 麥兜, 你知唔知道呢個筒入面有 d 咩野？
麥兜: 知, 我唸個筒入面有朱古力
E: 其實個筒入面冇朱古力, 其實入面係.....
Trial 1: **SHOW!!!** → test 1
(打開 Smarties 筒, 把它傾斜, 讓小朋友看到裡面, 保持 Smarties 筒打開)
E: 麥兜, 其實入面係....
(向麥兜展示 Smarties 筒內的東西)

唔知 ☐

(GET the child to agree with you that "入面有朱古力", 若小朋友說其他東西
first prompt, "個筒似唔似裝住 d 朱古力?"
second prompt, "呢個係咩野筒黎架? 入面應該裝住 d 咩野?"
third prompt, "個筒入面應該有朱古力, 定係書?")

E: 麥兜, 你知唔知道呢個筒入面有 d 咩野？
麥兜: 知, 我唸個筒入面有朱古力
E: 其實個筒入面冇朱古力, 其實入面係.....
Trial 1: **SHOW!!!** → test 1
(打開 Smarties 筒, 把它傾斜, 讓小朋友看到裡面, 保持 Smarties 筒打開)
E: 麥兜, 其實入面係....
(向麥兜展示 Smarties 筒內的東西)

"False Belief"---- Trial 2

E: 咁而家你知唔知道呢個筒入面有 d 咩野？

知 ☐, 係咩野黎架？_____

☐(✓) **好叻喎! 依..... 阿 may 黎左喎!**
佢從來都冇睇過呢個筒入面有 d 咩野, 頭先我俾麥兜睇既時候, 佢又唔係度
→ (inquiring) **咁阿 may 知唔知道呢個筒入面有 d 咩野？**
☐ 知 ☐ 唔知
→ (inquiring) **咁麥兜知唔知道呢個筒入面有 d 咩野？**
☐ 知 ☐ 唔知
→ (inquiring) **咁邊個睇過呢個筒入面有 d 咩野? 阿 may 定係 麥兜?**
☐ May ☐ 麥兜 → NEXT TASK ( )

☐(x) E: 其實入面係.... Trial 2: **SHOW!!!** → test 2
(打開 smarties 筒, 把它傾斜, 讓小朋友看到裡面)
E: 麥兜, 其實入面係....
(向麥兜展示 Smarties 筒內的東西)

唔知 ☐ E: 其實入面係.... Trial 2: **SHOW!!!** → test 2
(打開 smarties 筒, 把它傾斜, 讓小朋友看到裡面)
E: 麥兜, 其實入面係....
(向麥兜展示 Smarties 筒內的東西)

False Belief ----- Trial 3

E: 咁而家你知唔知道呢個筒入面有ｄ咩野？

知 ☐，係咩野黎架？_____

☐(✓) 好叻喎! 依..... 阿 may 黎左喎!
佢從來都冇睇過呢個筒入面有ｄ咩野, 頭先我俾麥兜睇既時候, 佢又唔係度
→ (inquiring) 咁阿 may 知唔知道呢個筒入面有ｄ咩野？
☐ 知 ☐ 唔知
→ (inquiring) 咁麥兜知唔知道呢個筒入面有ｄ咩野？
☐ 知 ☐ 唔知
→ (inquiring) 咁邊個睇過呢個筒入面有ｄ咩野? 阿 may 定係 麥兜?
☐ May ☐ 麥兜 → NEXT TASK ( )

☐(x) E: 其實入面係.... Trial 3: **SHOW!!!** → test 3
(打開 smarties 筒, 把它傾斜, 讓小朋友看到裡面)
E: 麥兜, 其實入面係....
(向麥兜展示 Smarties 筒內的東西)

唔知 ☐ E: 其實入面係.... Trial 3: **SHOW!!!** → test 3
(打開 smarties 筒, 把它傾斜, 讓小朋友看到裡面)
E: 麥兜, 其實入面係....
(向麥兜展示 Smarties 筒內的東西)

False Belief ----- Trial 4

E: 咁而家你知唔知道呢個筒入面有ｄ咩野？

知 ☐，係咩野黎架？_____

☐(✓) 好叻喎! 依.....阿 may 黎左喎!
佢從來都冇睇過呢個筒入面有ｄ咩野
→ (inquiring) 咁阿 may 知唔知道呢個筒入面有ｄ咩野？
☐ 知 ☐ 唔知
→ (inquiring) 咁麥兜知唔知道呢個筒入面有ｄ咩野？
☐ 知 ☐ 唔知
→ (inquiring) 咁邊個睇過呢個筒入面有ｄ咩野? 阿 may 定係 麥兜?
☐ May ☐ 麥兜 → NEXT TASK ( )

☐(x) 咁我地玩第二樣野羅! → NEXT TASK ( )

唔知 ☐ 咁我地玩第二樣野羅! → NEXT TASK ( )

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"Knowing How" ——— Task ( ) 閃光玩具 (Self) 高飛狗 & Mickey

****

SETUP: 將閃光玩具放在桌上，面向著小朋友，請勿讓小朋友看到玩具的後面

閃光玩具—Trial 1

E: 呢個玩具有兩隻眼仔，你識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 咁你玩一次俾我睇！

OK ☐→ 好叻喎！咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → OTHER 1

唔 OK ☐→其實係咁樣既... Trial 1: SHOW!! → test 1

SHOW PROCEDURE: 1) 拿起個玩具，揸轉佢，讓小朋友看到玩具的後端 2) 大力拉條黃色膠尾一下，使玩具眼著燈

唔識 ☐ 其實係咁樣既... Trial 1: SHOW!! → test 1

SHOW PROCEDURE: 1) 拿起個玩具，揸轉佢，讓小朋友看到玩具的後端 2) 大力拉條黃色膠尾一下，使玩具眼著燈

閃光玩具 —— Trial 2

E: 咁而家你識唔識得點樣整到對眼仔閃下閃下?

☐ 識，咁你玩一次俾我睇！

OK ☐ 好叻喎！咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → OTHER 1

唔 OK ☐ 咁而家你識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 好叻喎！咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → OTHER 1

唔識 ☐ 其實係咁樣既... Trial 2: SHOW!! → test 2

SHOW PROCEDURE: 1) 拿起個玩具，揸轉佢，讓小朋友看到玩具的後端 2) 大力拉條黃色膠尾一下，使玩具眼著燈

☐ 唔識，其實係咁樣既... Trial 2: SHOW!! → test 2

SHOW PROCEDURE: 1) 拿起個玩具，揸轉佢，讓小朋友看到玩具的後端 2) 大力拉條黃色膠尾一下，使玩具眼著燈

閃光玩具 —— Trial 3

E: 咁而家你識唔識得點樣整到對眼仔閃下閃下?

☐ 識，咁你玩一次俾我睇！

OK ☐ 好叻喎！咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → OTHER 1

唔 OK ☐ 咁而家你識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 好叻喎！咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到對眼仔閃下

有 ☐ 沒有 ☐ → OTI

唔識 ☐ → OTHER 1

☐ 唔識 → OTHER 1

"Knowing How" ——— Task ( ) 閃光玩具 (Other 1) [AS-NF] (2)

****

SETUP: 將閃光玩具放在桌上, 面向著高飛狗

睇下邊個黎左先.....

E: 高飛狗你識唔識得點樣整到對眼仔閃下閃下? (面向高飛狗說)

W: 唔識呀, 我唔識得點樣整到對眼仔閃下閃下?

E: 高飛狗, 其實係咁樣既..... (向高飛狗 示範)

SHOW PROCEDURE: 1) 拿起個玩具, 搽轉佢, 讓高飛狗 看到玩具的後端 2) 大力拉條黃色膠尾一下, 使玩具眼著燈

E: 咁高飛狗識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 唔識 ☐

E: 高飛狗你自己話啦, 你識唔識得點樣整到對眼仔閃下閃下? (面向高飛狗說)

E: (放高飛狗埋自己耳仔) 啊!... 不如你試下啦....

SUCCESS: 用高飛狗隻手大力拉條黃色膠尾一下, 使玩具眼著燈

E: 咁你話高飛狗識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 咁高飛狗係點學識架? _____

AQ2: 我有冇做過俾高飛狗睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → OTHER 2

唔識 ☐ 點解高飛狗唔識既? _____

AQ2: 我有冇做過俾高飛狗睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → OTHER 2

"Knowing How" ——— Task ( ) 閃光玩具 (Other 2) [AS-NF] (2)

****

(mickey mouse 出現 .....)

E: 依...mickey mouse 黎左喎..... 佢從來都冇睇過呢個魔術, 頭先我教高飛狗點樣玩既時候, 佢又唔係度喎, 咁 mickey mouse 識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 唔識 ☐

E: mickey mouse 你自己話你識唔識得點樣整到對眼仔閃下閃下? (面向 mickey mouse 說)

E: (放 mickey mouse 埋自己耳仔) 啊!... 不如你試下啦....

FAILURE: 用 mickey mouse 隻手 touch 玩具眼仔

E: 咁你話 mickey mouse 識唔識得點樣整到對眼仔閃下閃下?

識 ☐ 咁 mickey mouse 係點學識架? _____

AQ3: 我有冇做過俾 mickey mouse 睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → NEXT TASK

唔識 ☐ 點解 mickey mouse 唔識既? _____

AQ3: 我有冇做過俾 mickey mouse 睇點樣整到對眼仔閃下閃下?

有 ☐ 沒有 ☐ → NEXT TASK

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"Knowing How" -------- Task ( ) 媽蟻爬行 (Self) 叮噹 & Hello Kitty

****

SETUP: 將媽蟻玩具放在桌上, 面向著小朋友, 請勿讓小朋友看到玩具的後面

媽蟻爬行----Trial 1

E: 呢度有 d 蟻, 你識唔識得點樣整到 d 蟻係個盒裡面周圍行?

識 ☐ 咁你玩一次俾我睇 !

OK ☐ → 好叻喎 ! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → OTHER 1

唔 OK ☐→其實係咁樣既... Trial 1: SHOW!! → test 1

SHOW PROCEDURE: 1) 拿起個玩具, 搽轉佢, 讓小朋友看到玩具的後端 2) 向左向右撥動手捍 3) 把玩具搽回前面, 讓小朋友看到媽蟻在走動

唔識 ☐ 其實係咁樣既... Trial 1: SHOW!! → test 1

SHOW PROCEDURE: 1) 拿起個玩具, 搽轉佢, 讓小朋友看到玩具的後端 2) 向左向右撥動手捍 3) 把玩具搽回前面, 讓小朋友看到媽蟻在走動

媽蟻爬行 ---- Trial 2

E: 咁而家你識唔識得點樣整到 d 蟻周圍行?

☐ 識, 咁你玩一次俾我睇 !

OK ☐ 好叻喎 ! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → OTHER 1

唔 OK ☐ 咁而家你識唔識得點樣整到 d 蟻周圍行?

識 ☐ 好叻喎 ! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → OTHER 1

唔識 ☐ 其實係咁樣既... Trial2: SHOW!! → test 2

SHOW PROCEDURE: 1) 拿起個玩具, 搽轉佢, 讓小朋友看到玩具的後端 2) 向左向右撥動手捍 3) 把玩具搽回前面, 讓小朋友看到媽蟻在走動

☐ 唔識, 其實係咁樣既... Trial 2: SHOW!! → test 2

SHOW PROCEDURE: 1) 拿起個玩具, 搽轉佢, 讓小朋友看到玩具的後端 2) 向左向右撥動手捍 3) 把玩具搽回前面, 讓小朋友看到媽蟻在走動

媽蟻爬行 ---- Trial 3

E: 咁而家你識唔識得點樣整到 d 蟻周圍行?

☐ 識, 咁你玩一次俾我睇 !

OK ☐ 好叻喎 ! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → OTHER 1

唔 OK ☐ 咁而家你識唔識得點樣整到 d 蟻周圍行?

識 ☐ 好叻喎 ! 咁你係點學識架?_____

AQ1: 我有冇做過俾你睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → OTHE

唔識 ☐ → OTHER 1

"Knowing How" --------- Task ( ) **媽蟻爬行** (Other 1) [AF-NS] (3)

****

SETUP: 將媽蟻玩具放在桌上，面向著叮噹

E: 叮噹你識唔識得點樣整到 d 蟻係個盒裡面周圍行? (面向叮噹說)

W: 唔識呀，我唔識得點樣整到 d 蟻係個盒裡面周圍行?

E: 叮噹，其實係咁樣既..... (向叮噹 示範)

SHOW PROCEDURE: 1) 拿起個玩具，揸轉佢，讓小朋友看到玩具的後端
2) 向左向右撥動手捍 3) 把玩具揸回前面，讓小朋友看到媽蟻在走動

E: **咁叮噹識唔識得點樣整到 d 蟻係個盒裡面周圍行?**

識 ☐ 唔識 ☐

E: 叮噹你自己話你識唔識得點樣整到 d 蟻係個盒裡面周圍行?
(面向叮噹說)

E: (放叮噹埋自己耳仔) 啊!... 不如你試吓啦....

FAILURE: 用 "叮噹" 繞著玩具走數步

E: **咁你話叮噹識唔識得點樣整到 d 蟻係個盒裡面周圍行?**

識 ☐ 咁叮噹係點學識架? _____

AQ2: 我有冇做過俾叮噹睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → **OTHER 2**

唔識 ☐ 點解叮噹唔識既? _____

AQ2: 我有冇做過俾叮噹睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → **OTHER 2**

"Knowing How" --------- Task ( ) **媽蟻爬行** (Other 2) [AF-NS] (3)

****

SETUP: 將媽蟻玩具放在桌上，面向著"Hello Kitty"

("Hello Kitty" 出現 .....)

E: 依..."Hello Kitty" 黎左喎..... 佢從來都冇睇過呢個魔術，頭先我教叮噹點樣玩既時候，佢又唔係度喎，**咁"Hello Kitty" 識唔識得點樣整到 d 蟻係個盒裡面周圍行?**

識 ☐ 唔識 ☐

E: "Hello Kitty" 你自己話你識唔識得點樣整到 d 蟻係個盒裡面周圍行?
(面向 "Hello Kitty" 說)

E: (放 "Hello Kitty" 埋自己耳仔) 啊!... 不如你試吓啦....

SUCCESS: 用 "Hello Kitty" 隻手撥動手捍，令媽蟻在走動

E: **咁你話 "Hello Kitty" 識唔識得點樣整到 d 蟻係個盒裡面周圍行?**

識 ☐ 咁 "Hello Kitty" 係點學識架? _____

AQ3: 我有冇做過俾"Hello Kitty"睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → **NEXT TASK**

唔識 ☐ 點解 "Hello Kitty" 唔識既? _____

AQ3: 我有冇做過俾"Hello Kitty"睇點樣整到 d 蟻係個盒裡面周圍行?

有 ☐ 沒有 ☐ → **NEXT TASK**

"Knowing That" ---------- Drawer 1 (Self)　　Hello Kitty & 叮噹

****

SETUP:　1) 取出 Hello Kitty, 放 叮噹 在一旁 2) 擦膠放上格櫃桶

Drawer —See (1)

E: 你知唔知道呢格櫃桶入面有 d 咩野？(指著上格櫃桶, 手指仍然按著櫃桶, 以免小朋友打開偷看!)

知 ☐ 係咩野黎架？_____

☐(✓) 好叻喎！咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

☐(x) 其實入面唔係 xx 黎過喎!　其實入面係....

Trial 1: SHOW!!! → test 1

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

唔知 ☐ 其實入面係....

Trial 1: SHOW!!! → test 1

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

Drawer —See (2)

E: 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐, 係咩野黎架？_____

☐(✓) 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

☐(x) 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

唔知 ☐ 其實入面係....　Trial 2: SHOW!!! → test 2

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

唔知 ☐ 其實入面係....　Trial 2: SHOW!!! → test 2

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

Drawer —See (3)

E: 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐, 係咩野黎架？_____

☐(✓) 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

☐(x) 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

唔知 ☐ → OTHER 1

唔知 ☐ → OTHER 1

E : Hello Kitty 你知唔知道呢格櫃桶入面有 d 咩野？(指著上格櫃桶)

W: 唔知呀，我唔知道呢格櫃桶入面有 d 咩野

E: Hello Kitty，其實入面係… (向 Hello Kitty 示範)

SHOW (拉出櫃桶，把它傾斜)

E: 咁 Hello Kitty 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

E: Hello Kitty 你自己話你知唔知道呢格櫃桶入面有 d 咩野？
(面向 Hello Kitty 說)

E: (放 Hello Kitty 埋自己耳仔) 啊!…

FAILURE: Hello Kitty 話呢格櫃桶入面有把間尺，

E: 咁你話 Hello Kitty 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 咁 Hello Kitty 係點知架? _____
AQ2: 我有冇俾 Hello Kitty 睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → OTHER 2

唔知 ☐ 點解 Hello Kitty 唔知既? _____
AQ2: 我有冇俾 Hello Kitty 睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → OTHER 2

("叮噹" 出現 ……)

E: 依…"叮噹" 黎左喎……佢從來都冇睇過呢格櫃桶入面有 d 咩野，頭先我俾 Hello Kitty 睇既時候，佢又唔係度喎，咁叮噹知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

E: "叮噹" 你自己話你知唔知道呢格櫃桶入面有 d 咩野？
(面向 Hello Kitty 說)

E: (放"叮噹" 埋自己耳仔) 啊!…

FAILURE: "叮噹" 話呢格櫃桶入面有把間尺

E: 咁你話"叮噹" 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 咁 "叮噹" 係點知架? _____
AQ2: 我有冇俾"叮噹"睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → NEXT

唔知 ☐ 點解"叮噹"唔知既? _____
AQ2: 我有冇俾"叮噹"睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → NEXT

"Knowing That" ---------- Drawer 2 (Self)　　Mickey mouse & 高飛狗

****

SETUP:　1) 取出 Mickey mouse, 放 高飛狗 在一旁 2) 車仔放下格櫃桶

Drawer —See (1)

E: 你知唔知道呢格櫃桶入面有 d 咩野？(指著下格櫃桶, 手指仍然按著櫃桶, 以免小朋友打開偷看!)

知 ☐ 係咩野黎架？_____

☐(✓) 好叻喎！咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

☐(x) 其實入面唔係 xx 黎過喎!　其實入面係....

Trial 1: SHOW!!! → test 1

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

唔知 ☐ 其實入面係....

Trial 1: SHOW!!! → test 1

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

Drawer —See (2)

E: 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐，係咩野黎架？_____

☐(✓) 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

☐(x) 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

唔知 ☐ 其實入面係....　Trial 2: SHOW!!! → test 2

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

唔知 ☐ 其實入面係....　Trial 2: SHOW!!! → test 2

(拉出櫃桶, 把它傾斜, 讓小朋友看到裡面, 手指仍然按著其他格櫃桶, 勿讓其他格櫃桶滑出!)

Drawer —See (3)

E: 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐，係咩野黎架？_____

☐(✓) 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

☐(x) 咁而家你知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 好叻喎! 咁你係點知架?_____

AQ1: 我有冇俾你睇過呢格櫃桶入面有 d 咩野呀?

有 ☐　沒有 ☐　→ OTHER 1

唔知 ☐ → OTHER 1

唔知 ☐ → OTHER 1

E : Mickey mouse 你知唔知道呢格櫃桶入面有 d 咩野？(指著第二格櫃桶)

W: 唔知呀，我唔知道呢格櫃桶入面有 d 咩野

E: Mickey mouse，其實入面係… (向 Mickey mouse 示範)

SHOW (拉出櫃桶，把它傾斜)

E: 咁 Mickey mouse 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

E: Mickey mouse 你自己話你知唔知道呢格櫃桶入面有 d 咩野？
(面向 Mickey mouse 說)

E: (放 Mickey mouse 埋自己耳仔) 啊!…

SUCCESS: Mickey mouse 話呢格櫃桶入面有架車仔，

E: 咁你話 Mickey mouse 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 咁 Mickey mouse 係點知架? _____
AQ2: 我有冇俾 Mickey mouse 睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → OTHER 2

唔知 ☐ 點解 Mickey mouse 唔知既? _____
AQ2: 我有冇俾 Mickey mouse 睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → OTHER 2

("高飛狗" 出現 ……)

E: 依…"高飛狗" 黎左喎……佢從來都冇睇過呢格櫃桶入面有 d 咩野，頭先我俾 Mickey mouse 睇既時候，佢又唔係度喎，咁高飛狗知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

E: "高飛狗" 你自己話你知唔知道呢格櫃桶入面有 d 咩野？
(面向 Mickey mouse 說)

E: (放"高飛狗" 埋自己耳仔) 啊!…

SUCCESS: "高飛狗" 話呢格櫃桶入面有架車仔

E: 咁你話"高飛狗" 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 咁 "高飛狗" 係點知架? _____
AQ2: 我有冇俾"高飛狗"睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → NEXT

唔知 ☐ 點解"高飛狗"唔知既? _____
AQ2: 我有冇俾"高飛狗"睇過呢格櫃桶入面有 d 咩野呀?
有 ☐ 沒有 ☐ → NEXT

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"False Belief" Bandage Task ------ (Self)

****

SETUP: 1) 取出 麥兜, 放阿 may 在一旁 2) 將麥兜放在桌上, 小朋友的旁邊, 面向著實驗員
3) 將顏色筆盒放在桌上, 實驗員的旁邊

False Belief ----- Trial 1

E: 呢度有個盒, 你知唔知道呢個盒入面有 d 咩野 ?

知 ☐ 係咩野黎架 ? _____

(GET the child to agree with you that "入面有顏色筆/ 筆", 若小朋友說其他東西
first prompt, "個盒似唔似裝住 d 顏色筆?"
second prompt, "呢個係咩野盒黎架? 入面應該裝住 d 咩野?"
third prompt, "個盒入面應該有顏色筆, 定係書?")

E: 其實個盒入面冇顏色筆, 其實入面係.....
Trial 1: **SHOW!!!** → test 1
(打開顏色筆盒, 讓小朋友看到裡面)

唔知 ☐ (GET the child to agree with you that "入面有顏色筆/ 筆", 若小朋友說其他東西
first prompt, "個盒似唔似裝住 d 顏色筆?"
second prompt, "呢個係咩野盒黎架? 入面應該裝住 d 咩野?"
third prompt, "個盒入面應該有顏色筆/ 筆, 定係書?")

E: 其實個盒入面冇顏色筆, 其實入面係.....
Trial 1: **SHOW!!!** → test 1
(打開顏色筆盒, 讓小朋友看到裡面)

"False Belief"----- Trial 2

E: 咁而家你知唔知道呢個盒入面有 d 咩野 ?

知 ☐, 係咩野黎架 ? _____

☐(✓) 好叻喎! Q1:咁我未打開俾你睇之前, 你知唔知道呢個盒入面有 d 咩野 ?
唔知 ☐ → **OTHER**
知 ☐(Q2) 肯定? 未打開俾你睇都知? **Open End

(Q3) 咁你係點知架? **Open End

→ **OTHER**

☐(x) E: 其實入面係.... Trial 2: **SHOW!!!** → test 2
(打開顏色筆盒, 讓小朋友看到裡面)

唔知 ☐ E: 其實入面係.... Trial 2: **SHOW!!!** → test 2
(打開顏色筆盒, 讓小朋友看到裡面)

"False Belief"----- Trial 3

E: 咁而家你知唔知道呢個盒入面有 d 咩野 ?

知 ☐, 係咩野黎架 ? _____

☐(✓) 好叻喎! Q1:咁我未打開俾你睇之前, 你知唔知道呢個盒入面有 d 咩野
唔知 ☐ → **OTHER**
知 ☐(Q2) 肯定? 未打開俾你睇都知? **Open End

(Q3) 咁你係點知架? **Open End

→ **OTHER**

☐(x) → **OTHER**

唔知 ☐ → **OTHER**

"False Belief" Bandage Task ------- (Other)

****

E: 麥兜，你知唔知道呢個盒入面有ｄ咩野？

麥: 知，我唸個盒入面有顏色筆

E: 其實個盒入面冇顏色筆，其實入面係.....

SHOW!!!

(打開顏色筆盒，讓麥兜看到裡面)

E: 咁麥兜知唔知道呢個盒入面有ｄ咩野？

☐ 知 ☐ 唔知

E: 咁麥兜有冇睇過呢個盒入面有ｄ咩野?

☐ 有 ☐ 沒有

(阿 may 出現.....)

E: 依..... 阿 may 黎左喎! ....佢從來都冇睇過呢個盒入面有ｄ咩野，頭先我俾麥兜睇既時候，佢又唔係度喎，咁阿 may 知唔知道呢個盒入面有ｄ咩野？

☐ 知 ☐ 唔知

E: 咁阿 may 有冇睇過呢個盒入面有ｄ咩野?

☐ 有 ☐ 沒有 → NEXT TASK ( )

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"Knowing How" ——— 變色筆 [Task-3] A

****

SETUP: 1) 取出一張紙放在桌上 2) 將兩枝脫蓋顏色筆放在紙與實驗員之間, 但要遠離小朋友 3) 在紙上畫一條橫向小朋友的綠線 4) 把綠色筆放回原位 5) 用手指指著該線

E: 呢個係 "跳跳虎", 佢從來都冇睇過我玩魔術個喎, 咁呢度有條線, 佢係咩野色架 (指著線)? 綠色...係啦! 咁你話 "跳跳虎" 識唔識得點樣將呢條綠色既線變成紫色?
(假如小朋友不說線是綠色, prompt "係, 不過佢似唔似綠色呀?")

識 ☐
唔識 ☐

E: 不如我地問下跳跳虎羅, (面向跳跳虎說...) 跳跳虎, 你識唔識得點樣將呢條綠色既線變成紫色?

T: 唔識呀, 我唔識得點樣將呢條綠色既線變成紫色

E: 跳跳虎, 其實係咁樣既...

SHOW PROCEDURE: 1) 用綠色筆畫一條線) 2)拿起白色筆, 明顯地展示 3)用白色筆在綠線上油, 把它變成紫色

E: 咁你識唔識得點樣將條綠色既線變成紫色?
識 ☐ 唔識 ☐

E: 咁"跳跳虎" 而家識唔識得點樣將條綠色既線變成紫色?
識 ☐ 唔識 ☐

E: 依...Winnie the Pooh 黎左喎.....佢從來都冇睇過我玩魔術個喎, 咁你話 **Winnie the Pooh** 識唔識得點樣將條綠色既線變成紫色?
識 ☐ 唔識 ☐

E: 咁你有冇睇過呢個魔術呀?
有 ☐ 沒有 ☐

E: 咁"跳跳虎"有冇睇過呢個魔術呀?
有 ☐ 沒有 ☐

E: 咁 **Winnie the Pooh** 有冇睇過呢個魔術呀?
有 ☐ 沒有 ☐

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"Knowing How" ——— 閃光玩具 [Task-3] B

****

SETUP: 將閃光玩具放在桌上, 面向著小朋友, 請勿讓小朋友看到玩具的後面

E: 呢個係 "加菲貓", 佢從來都冇睇過我玩魔術個喎, 呢個玩具有兩隻眼仔, 咁你話 "加菲貓" 識唔識得點樣整到對眼仔閃下閃下?

識 ☐
唔識 ☐

E: 不如我地問下加菲貓羅, (面向加菲貓說...) 加菲貓, 你識唔識得點樣整到對眼仔閃下閃下?

C: 唔識呀, 我唔識得點樣整到對眼仔閃下閃下

E: 加菲貓, 其實係咁樣既...

SHOW PROCEDURE: 1) 拿起個玩具, 掙轉佢,
2) 大力拉條黃色膠尾一下, 使玩具眼著燈

E: 咁"加菲貓" 而家識唔識得點樣整到對眼仔閃下閃下?
識 ☐ 唔識 ☐

E: 依...SNOOPY 黎左喎.....佢從來都冇睇過我玩魔術個喎, 咁你話 **SNOOPY** 識唔識得點樣整到對眼仔閃下閃下?
識 ☐ 唔識 ☐

E: 咁你識唔識得點樣整到對眼仔閃下閃下?
識 ☐ 唔識 ☐

E: 咁"加菲貓"有冇睇過呢個魔術呀?
有 ☐ 沒有 ☐

E: 咁 **SNOOPY** 有冇睇過呢個魔術呀?
有 ☐ 沒有 ☐

E: 咁你有冇睇過呢個魔術呀?
有 ☐ 沒有 ☐

"Knowing That" ——— Drawer 1 [Task-3] B

****

SETUP: 1) 取出"叮噹" 2) 取出櫃桶座, 用手指按著上下櫃桶門, 把整座向前傾搖, 使入面的物件向前移櫃桶的前端, 但櫃桶又不會被打開. 2) 將櫃桶座放在桌上, 實驗員的旁邊, 面向著小朋友 3) 攞放第一格櫃桶

E: 呢個係"叮噹", 佢從來都冇睇過呢格櫃桶入面有 d 咩野,咁你話叮噹知唔知道呢格櫃桶入面有 d 咩野？

知 ☐

唔知 ☐

E: 不如我地問下"叮噹"羅, (面向"叮噹"說...) "叮噹" 你知唔知道呢格櫃桶入面有 d 咩野？

D: 唔知呀, 我唔知道呢格櫃桶入面有 d 咩野

E: 叮噹, 其實入面係呢樣野

***SHOW** 叮噹 ONLY!!! (拉出櫃桶)

E: 咁"叮噹"而家知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

(Hello Kitty 出現 .....)

E: 依...Hello Kitty 黎左喎.....佢從來都冇睇過呢格櫃桶入面有 d 咩野,咁你話 **Hello Kitty** 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

E: 咁你知唔知道呢格櫃桶入面有 **d** 咩野?

知 ☐ 唔知 ☐

E: 咁"叮噹"有冇睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐

E: 咁 **Hello Kitty** 有冇睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐

E: 咁你有冇睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐

"Knowing That" ——— Drawer 2 [Task-3] A

****

SETUP: 1) 取出 Bear Bear 2) 車放第二格櫃桶

E: 呢個係"bear bear", 佢從來都冇睇過呢格櫃桶入面有 d 咩野,咁你話 **bear bear** 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐

唔知 ☐

E: 不如我地問下"bear bear"羅, (面向"bear bear"說...) "bear bear" 你知唔知道呢格櫃桶入面有 d 咩野？

D: 唔知呀, 我唔知道呢格櫃桶入面有 d 咩野

E: bear bear, 其實入面係呢樣野

***SHOW** bear bear ONLY!!! (拉出櫃桶)

E: 咁你知唔知道呢格櫃桶入面有 **d** 咩野?

知 ☐ 唔知 ☐

E: 咁**"bear bear"**而家知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

(Miffy 出現 .....)

E: 依...Miffy 黎左喎.....佢從來都冇睇過呢格櫃桶入面有 d 咩野,咁你話 **Miffy** 知唔知道呢格櫃桶入面有 d 咩野？

知 ☐ 唔知 ☐

E: 咁你有冇睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐

E: 咁**"bear bear"**有冇睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐

E: 咁 **Miffy** 有冇睇過呢格櫃桶入面有 d 咩野呀?

有 ☐ 沒有 ☐

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"False Belief" (m&m Task) [Task-3] B

****

SETUP: 1) 取出 亞 may & 麥兜 2) 將麥兜放在桌上, 小朋友的旁邊, 面向著實驗員 3) 將 smarties 筒放在桌上, 實驗員的旁邊

E: 呢個係麥兜... 佢從來都冇睇過呢個筒入面有 d 咩野, 咁你話麥兜知唔知道呢個筒入面有 **D** 咩野？

知 ☐

唔知 ☐

E: 不如我地問下麥兜羅... (面向麥兜說) 麥兜你知唔知道呢個筒入面有 D 咩野？

M: 知, 我唸個筒入面有朱古力

E: 麥兜, 其實入面係.....

SHOW (打開 smarties 筒, 把它傾斜, 讓麥兜看到裡面)

M: 下? 騙人既! 唔係朱古力黎個喎!

E: 咁麥兜而家知唔知道呢個筒入面有 d 咩野？

☐ 知 ☐ 唔知

E: 依... 亞 may 黎左喎!.... 佢從來都冇睇過呢個筒入面有 d 咩野, 咁你話亞 **may** 知唔知道呢個筒入面有 **D** 咩野？

☐ 知 ☐ 唔知

E: 咁你知唔知道呢個筒入面有 d 咩野？

☐ 知 ☐ 唔知

E: 咁麥兜未睇過呢個筒入面有 **D** 咩野之前, 佢知唔知道呢個筒入面有 d 咩野？

☐ 知 ☐ 唔知

Subject No.: _____ Sex: F / M Age: 3 / 4 / 5

"False Belief" (Bandage Task) [Task-3] A

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SETUP: 1) 取出 Mickey mouse & 高飛狗 2) 將高飛狗放在桌上, 小朋友的旁邊, 面向著實驗員 3) 將顏色盒放在桌上, 實驗員的旁邊

E: 呢個係高飛狗... 佢從來都冇睇過呢個盒入面有 d 咩野, 咁你話高飛狗知唔知道呢個盒入面有 **D** 咩野？

知 ☐

唔知 ☐

E: 不如我地問下高飛狗羅... (面向高飛狗說) 高飛狗你知唔知道呢個盒入面有 D 咩野？

M: 知, 我唸個盒入面有顏色筆

E: 高飛狗, 其實入面係.....

SHOW (打開顏色盒, 把它傾斜, 讓高飛狗看到裡面)

M: 下? 騙人既! 唔係顏色筆黎個喎!

E: 咁你知唔知道呢個盒入面有 d 咩野？

☐ 知 ☐ 唔知

E: 咁高飛狗而家知唔知道呢個盒入面有 d 咩野？

☐ 知 ☐ 唔知

E: 依... Mickey mouse 黎左喎!.... 佢從來都冇睇過呢個盒入面有 d 咩野, 咁你話 **Mickey mouse** 知唔知道呢個盒入面有 **D** 咩野？

☐ 知 ☐ 唔知

E: 咁高飛狗未睇過呢個盒入面有 **D** 咩野之前, 佢知唔知道呢個盒入面有 d 咩野？

☐ 知 ☐ 唔知